LIBRARY OF CONGRESS
121737
NOV 6 1899
SMITHSONIAN DEPOSIT.

THE AMERICAN GAS LIGHT JOURNAL

REDMAN & KENNY, N.Y.

PUBLISHING OFFICE No. 32 PINE STREET

DEVOTED TO THE INTERESTS OF ILLUMINATION, HEATING, MECHANICAL, CHEMICAL AND GENERAL SCIENCE.

VOLUME LXXI. No. 19. Whole No. 1,274. | NEW YORK, MONDAY, NOVEMBER 6, 1899. | $4 PER ANNUM, IN ADVANCE.

A. M. CALLENDER & CO., Proprietors. C. E. SANDERSON, Manager. THOMAS J. CUNNINGHAM and ELBERT P. CALLENDER, Editors.

ENTERED AT THE POST OFFICE AT NEW YORK, N. Y., AS SECOND-CLASS MATTER.

CONTENTS.

An Asterisk (*) denotes an illustrated article.

OFFICIAL NOTICES —

Cost of Proceedings, Western Gas Association, to Non-Members. 725

Meeting of the Kansas Gas, Water and Electric Light Association. 725

EDITORIALS —

Briefly Told 725

Prepayment Meters and the Availability Thereof—The Astoria "Gas Grab."

Twenty-seventh Annual Meeting of the American Gas Light Association—Abstract of Proceedings—Continued from Page 693..... 726

First Day's Session, Wed., Oct. 18—Question Box—Second Day's Session—Recent Developments in Artificial Illumination, by President Henry Morton—Committee to Award the Beal Medal—Report of Committee on Next Place of Meeting—Report of Committee on President's Address—Another View of Interior Illumination, by Mr. F. N. Morton.

*Some Experiments with the Edgerton Standard, by Mr. Rollin Norris..... 730

A German Gas Works, by Mr. Frederic Egner 734

American Competition—No. V.—By Mr. John Thompson..... 735

Pointers on Practical Gasfitting—No. II.—Continued from Page 614 736

ITEMS OF INTEREST FROM VARIOUS LOCALITIES..... 737

A Line from Belfast, Me.—"X" Refers to the Proposed Transfer of the Lowell (Mass.) Works—Mr. Egner Forwards a Letter—Death of Mr. George E. Fenety—The Mount Carmel (Pa.) Gas Light Company—Mr. Weber Reports Some Contracts—The San Francisco (Cal.) Gas and Coke Company—Gas Rate Agitation, Haverhill, Mass.—Death of Mr. Thomas F. Kendrick, Nashville, Tenn.—Change of Capital Stock, Bethlehem, Pa. Public Lighting, Minneapolis, Minn.—Death of Mr. Chas. H. Porter—Franchise Extended, South Bend, Ind.—Reorganizing the Nashville, Tenn., Company—Cheaper Gas for Paterson and Passaic, N. J.—The Standard Gas Company, Danville, Pa.—A Deputy Gas Meter Inspector—And Other Items.

The Market for Gas Securities..... 739

[OFFICIAL NOTICE.]

Cost of Proceedings, Western Gas Association, to Non-Members.

WESTERN GAS ASSOCIATION, OFFICE OF THE SECRETARY,
NEW ALBANY, IND., Sept. 29, 1899.

Bound copies containing the Proceedings of the Western Gas Association for the years 1896-97-98 can be obtained for the sum of $2 each. Make your remittances payable to the Secretary.

JAMES W. DUNBAR, Secy.

[OFFICIAL NOTICE.]

Meeting of the Kansas Gas, Water and Electric Light Association.

OFFICE OF THE SECRETARY AND TREASURER,
LEAVENWORTH, KAS., Oct. 19, 1899.

Gentlemen: The Fall meeting of the Kansas Gas, Water and Electric Light Association will be held in Kansas City, Kas., Wednesday and Thursday, November 15th and 16th next. On behalf of the Association I cordially invite you to be present, believing that such presence will prove advantageous to you and to the Company you represent. Practical papers, relating to gas, water and electric light, will be discussed at the meeting.

Headquarters and place of meeting will be decided upon in the next few days, and the selections will, in prompt, due time, be communicated to the members.

J. H. FOLEY, Secretary.

BRIEFLY TOLD.

PREPAYMENT METERS AND THE AVAILABILITY THEREOF.—The first paper read at the last meeting of the American Gas Light Association dealt with "Notes on Prepayment Meters," and its author was Mr. A. H. Strecker, whose fortune at the present time is to direct the actual engineering operations of the Essex and Hudson Gas Company, which corporation may be regarded as the legal successor to the rights heretofore enjoyed by the Newark (N. J.) Gas Light Company, the Citizens Gas Light Company, of Newark, and other subsidiary gas companies in Essex and Hudson counties, their assigns, etc. As a practical gas man, Mr. Strecker has the right to speak from a long and an odd experience; for he has had much practice in what might be termed the metropolitan gas field. In New York he has served; in Newark he works faithfully and conscientiously and successfully. But we were certainly prepared to hear from him something more to the point over prepayment meters than can be found in his "notes," which belief rested on our knowledge that Mr. Strecker is beyond doubt a practical rather than a cadetical or a theoretical man. The lines of his paper, in so far as his words gave freedom to his thought, are disappointing, in that his implied verdict is that prepayment meters are not successes, unless the company maintaining them obtains or gets a higher price for the gas registered by them than it receives from gas distributed or sold in the ordinary way through the regular or orthodox meter. That Mr. Strecker is a man of opinions may not be denied, that he is a man of honesty may not be doubted; but situation sometimes obliges one to suppress an opinion, and exigency may also require evasion. And so it looks that, were Mr. Strecker in sole charge of the business of the Essex and Hudson Gas Company, despite his statement that gas sent through prepayment meters costs about 15.5 cents more "in the bank" than had like quantities been sent through ordinary meters, he would put a meter of the prepayment sort wherever such meter could be placed, outside the house of a thief. The discussion on his paper should have pleased him, for the debate was brisk and vigorous. It was introduced by Mr. A. S. Miller, who unfortunately confined himself in that talk to his knowledge of prepayments as such went in Long Island City. If the Virginian had dilated a bit over his experience therewith in New York city proper (Mr. Miller is the Chief Engineer of the New Amsterdam Gas Company, the works of which concern are in Long Island City, but the main gas business of which is in New York), he might have added something of moment to the discussion. And the latter statement is quite to the point, seeing that his employers are "looking for any sort of business" in "the city" at anything under 50 cents per 1,000 cubic feet. However, the next speaker (Mr. Chas. H. Nettleton, of Derby, Conn.), who serves with gas a community that is, as to its main, a manufacturing sort, managed to make a pretty good showing on behalf of the prepayment meter, which showing was well fortified with facts and figures. Mr. Nettleton, who has been in the gas trade in a practical way for many years, and none who know him may accuse him of any desire to fool himself, rather put a clincher for prepayments when he declared: "We have to-day over 750 prepayment meters in use, with an average consumption very close to that stated by Mr. Strecker—10,000 cubic feet per annum. The prepayment meter enables us to deal with a class of people that we had not been able

to reach before, and which, *I think, we cannot reach with the ordinary meter*." Much more of a similar nature Mr. Nettleton said, but that which is quoted is sufficient to show that he thinks and believes that prepayment meters are here to stay. Others who shared in Mr. Nettleton's views were Mr. A. F. Reichelt, Mr. John M. Daniels and Mr. C. R. Collins. The first named gentleman made one good point in his contribution to the debate when he remarked that "the clerical work connected with the prepayment meter is very much less than with that of the regular meter—no bills, no postage stamps, only the Collector." Another tidy contribution in support of the prepayments was made by Mr. C. R. Collins in this remark: "We have had prepayment meters that were in use for three years, brought to the shop and tested, and they showed up as well as did the regular meters in respect of accuracy of registration." Many other lines of like testimony supporting the advantage of prepayment meters for certain classes in the using of gas were cited, and our only regret is that we were prevented by the rules of the Association from printing in complete form the useful discussion that was provoked by Mr. Strecker's well put together paper. We can and do say though, that the paper and its debate have proved, if more of the latter than we have seen during the past three years were necessary, that the prepayment meter is here to stay, and to grow while staying.

THE ASTORIA "GAS GRAB."—Gas has for a long time, and more or less, entered into politics. At the last session of the Legislature of this State a bill was introduced which permitted the Consolidated Gas Company, of New York city, to lay certain pipes under the East River for the purpose of conducting therethrough gas to its customers that was to be manfactured in Astoria on the East bank, or line of the East River. Forthwith a howl went up that the promoters were intent on "gas grabbing," whatever that may mean; for we always supposed that no hand of the human order could hold gas. The history of the proposed bill was that it went through the Assembly and was beaten in the Senate. The result of the passage of the bill would have been to free New York proper from the presence of certain objectionable factories—for such gas works in this vicinity have from time to time been alleged to be. As said before the bill was killed. It is not so long a hark from April to November, but the exigency of politics is strange. This November Mr. Robert Mazet, who is a candidate for re-election to the Assembly from the 19th New York district, and who has been somewhat concerned in an investigation of the whys and wherefores of New York's democratic management, has been accused of treachery to New York's best interests in having voted last spring to give to the Consolidated Gas Company its Astoria grant. The outcome of the charge was an appeal to the Secretary of War, Mr. Elihu Root, as to whether or not Mr. Mazet had been wrong in voting for the "grab," and Mr. Root's reply—he was of counsel for the Consolidated Company in connection with the Astoria bill—is here given, mainly because it is an excellent presentation of what the Astoria "Gas Grab" really was:

WAR DEPARTMENT,
WASHINGTON, October 27, 1899.

My dear Mr. Kenyon: I have received your letter of October 20, saying that Mr. Mazet had been criticised for his course in connection with the bill which was before the last Legislature, commonly called the "Astoria gas bill," and asking me about that bill. I have always considered that the bill ought to have passed on its merits. It undertook to do nothing except to authorize the Consolidated Gas Company to connect works which it proposed to build on the Long Island side of the East River with the pipes which it already had on the New York side, by means of laying its pipes under the bed of the river, on paying the value of the right of way to be ascertained by condemnation proceedings. This was a right given by the general statutes of the State to every telegraph, telephone and pipe line company in the State, and it had already been given by the Legislature to the Consolidated Gas Company's rival, the East River Gas Light Company, now known as the "New Amsterdam Gas Company." This bill was framed in the same words as the bill which gave the same right to the East River Company. The Consolidated Company certainly ought, in common fairness, to have the same privilege which has been granted to its rival, upon paying due compensation, and it would have been a great benefit to the city of New York to have gotten the gas works of the Consolidated Company off Manhattan Island. Every great city in Europe has compelled the gas companies to move their works out of its thickly settled regions. Gov. Roosevelt was in favor of the bill, provided a special provision for the compensation should be inserted, and to this the Company consented, although they considered it excessive. The best and most highly respected men in both houses of the Legislature voted for it, as you will see if you take the pains to examine the record. Mr. Mazet did nothing but his plain duty. Very truly yours,

ELIHU ROOT.

[ABSTRACT OF PROCEEDINGS.—Continued from page 693.]

TWENTY-SEVENTH ANNUAL MEETING OF THE AMERICAN GAS LIGHT ASSOCIATION.

HELD IN SHERRY'S HALL, NEW YORK CITY, OCT. 18 AND 19, 1899.

FIRST DAY'S SESSION, WEDNESDAY, OCT. 18.

At the close of the discussion on the paper[1] by Mr. Roberts the President announced that as the

QUESTION BOX

contained one query, and that as the time to adjournment was about equal to permitting speeches in answer thereto, he would ask the Secretary to read it. The question was:

> "What is the present opinion as to the comparative value of cement and lead for making joints in cast iron mains?"

The Secretary thought the questioner would not have to go far from the meeting room to have the moot point settled, which sentiment was indorsed by the President. The latter asked Mr. Bowen, of Newport News, Va., if he desired to speak to the subject.

Mr. Bowen said that he asked the question, having been led thereto by the insistence of the Council of his city that his Company should use lead instead of cement for jointing cast iron mains. Mr. Bowen was satisfied that cement was the better article to use, but to demonstrate that such was a fact to the average Councilman was a pretty difficult task.

Mr. Robert Young said he had used cement for main joints for 40 years, and was still using it. He preferred Rosendale cement to Portland, in that it was slow setting, thus giving time to get the head of the joint in the right place before the setting occurred. The one objection to it was that it had a greater tendency to break the pipe when contraction occurred than if lead had been used.

Mr. W. H. Baxter, of Petersburg, Va., said that they had used joints of all kinds. About 45 years ago 12 miles of mains were laid in Petersburg with cement joints, and the lines were singularly free from leakage. Occasionally a pipe would break, but the leak therefrom, because of its magnitude, was easily detected. Their experience was that cement joints, if properly made, were better than lead joints.

The President said in closing the discussion, that the method of making a good cement was thoroughly described in the answers to the Proceedings of the Educational Class.

On motion, the Association adjourned, to reconvene at 10 A.M., Thursday, October 19.

SECOND DAY'S SESSION—THURSDAY, OCTOBER 19.

President Humphreys called the meeting to order promptly at 10 A.M. and introduced President Henry Morton, of the Stevens Institute of Technology, Hoboken, N. J., who delivered the following lecture on

RECENT DEVELOPMENTS IN ARTIFICIAL ILLUMINATION.

Notwithstanding the flattering remarks of your President I cannot but feel that I am far from able, considering that my subject is "New or Recent Developments in Artificial Lighting," to say anything worth while, or that would be new, to the gentlemen before me, who are naturally closer to such new developments than I am myself. I think, however, I can perhaps say something which may be of interest, and possibly of some little use, by connecting what I know of those recent developments with something in the past, and thus be able perhaps to forecast a little in the future, and in this way give perhaps useful and perhaps also interesting suggestions or thoughts as to the immediate present, and as to what our own action should be, or how we should be guided, in face of the new things which are coming up, every day I might almost say, in this direction. It may seem to you as if I were making the excuse of the clerk, who, arriving habitually late, proposed to correct the error by going away correspondingly early; but by touching a little on past history, and then forecasting a little in the future, I think I may level myself up on the recent developments in this subject.

In view of this I should notice, in the first place, that I have had the great pleasure and honor of addressing this Association on two occasions previous to the present, making in all, with this, three addresses, the intervals being in each case just about ten years; and each of the two previous occasions, by chance, was connected with what might be called an epoch-making time in the relation of artificial illumination, more especially as bearing upon the use of gas. The first occasion was in October, 1878, and just at the time when the first announcement had

1. *Ante*, p. 691.

been made as to Mr. Edison's discovery of the division, as it was then called, of the electric light, or a method of producing by incandescence relatively small amounts of light from numerous centers. At that date he had not yet made the discovery of the carbon filament, and the lamps he was then proposing to produce were made of platinum, or of alloys of platinum, wound into spirals or straight rods, and heated to incandescence. The announcement of that, and the way it was brought out, had very great effect—very great financial effect—in creating great alarm among those interested in gas properties, and almost a panic. It was just at that critical time (although the arrangement had been made a year or more before) that I delivered an address[1] in the Lecture Hall of the Stevens Institute, on the subject of new developments in illumination, which chiefly related to the use of electricity; and illustrated and explained the use of the arc light, which was then just coming into use, although hardly yet established, for the lighting of streets and large places. I illustrated also what I thought would be the outcome of this new discovery by Mr. Edison, and took the ground, in the first place, that, as the thing was radically new, it would undoubtedly take a long time to develop it into a shape in which it could be made commercially useful. And it having been announced in the papers that Mr. Edison proposed to light New York and other principal cities within six months, I ventured the prediction that it would be six years, rather than six months, before he or anyone else, even admitting all that was claimed for his discovery, could do such a thing as light the great cities of the country with electricity; that there was no end of small developments (to say the least of it) and improvements in methods of construction of machinery to be made before any such result could be reached. Now it is a curious fact, and those who follow the history of this matter will be able to verify it, that although this was, of course, a mere offhand guess, as you may call it, as regards the time, it was in fact just about six years from that date before the first plant for general electric lighting was introduced into New York, which was about the first place to bring it out on any systematic and large scale. So that by accident I was, in that sense, just about right in that prediction. The principle upon which I ventured that prediction is, however, as applicable to-day as it was then, namely, that when any radical change is foretold we can always rest upon this view—that we must not be frightened, must not be in a hurry about things, because we may be quite sure that any radical change, even if it is going to come soon, will nevertheless be some time in coming, and will be sure to give us time enough to turn around.

Another point to which I drew attention at that date was that, while electricity as a new thing had come in, and had promised great things, it had had the effect of stirring up those who were interested in the manufacture or use of gas, in the direction of making improvements which they had never felt compelled, as it were, or strongly urged, to make before; and that consequently we could not compare the future of electric lighting with the future of gas lighting on the basis of assuming that the electric light was going on with rapid strides, and that the gas industry was going to stand still. It was frequently said, as though that were an explanation of the whole thing, and a guaranty of the future, that electricity was in its infancy. We may admit that readily, but there is always a great space between the mature man and the time when, as an infant, he takes his first step. And when a new subject comes up, granting that it is in its infancy, and that it is going to grow and will become useful, it will take time. Franklin, when asked the use of his first electrical results, said, "What is the use of a babe?" and suggested that "the babe would grow." That is perfectly true; but it is also true that it takes time to grow. Therefore, time must be allowed, and we must not be in a hurry to set the babe in the place of the mature man, on the throne of any subject. While alluding to this in connection with that early period I will mention two or three little incidents which may be a little amusing. In the first place I felt greatly flattered at the success of what I then said to the Association by being elected an honorary member the next morning, and receiving a vote of thanks for my lecture—showing that I had hit the point, at least in the direction of giving comfort; and, in the second place, I was amused at reading very shortly afterwards an editorial in the New York *Herald* (which had been booming the new electric developments of Edison very strongly), which was devoted entirely to myself, under the title of "A farthing candle, versus the electric light." I did not feel shocked, but rather a little flattered, by appearin the New York *Herald*, even under the title of a "farthing candle." Another amusing incident connected with that day was the fact that I was told by one of the audience that a reporter, who had sat next to him, after I got through the lecture, had turned to him and said, "Well, I am astonished to hear a beardless youth get up and venture to belittle the discoveries of the great Edison!" I still remain beardless, although the crime of youth I have outgrown, as you can see, to a large extent.

The next occasion on which I had the honor of addressing your Association was just about 10 years afterwards, or early in 1890, and then the thing which was prominent in my own mind, and was to a degree exercising the minds of your members generally, was the new development of the Welsbach mantle and lamp. That had come out a few years previously, and, through the kindness of Mr. Humphreys, I was one of the first who happened to have the lamp. I did have in practical use in my own house a number of these lamps; so that I had a very good opportunity to study them from day to day in practical use, and thus learn something about them. I made the Welsbach lamp the chief subject of my lecture on that occasion. That lecture was also delivered in the Stevens Institute, where I had facilities for experiments, and where I exhibited a number of those lights, and at that time drew attention to the circumstance that the Welsbach light had not yet made a commercial success. In fact, I recollect that it had met with precisely the opposite; and, as illustrating that, the fact may be mentioned that the stock, originally issued to the Company in New York and elsewhere was scaled down just about that time to one thirtieth of its nominal value, so that a stockholder received one share, of the nominal value of $5, in place of three $100 dollar shares. That being the condition of the thing commercially, I think I was rather venturesome in bringing the matter before the Association in the way I did by saying that the thing wanted in gas lighting was not so much an improvement in cheap processes for making gas as improvements in the use of the gas when made, by a burner which would yield some reasonable amount of energy in the form of light. I then gave the results of some experiments and calculations which showed that, by the burners then in use, which were the ordinary fishtail or batswing, and the Argand burner, only about one half, or, to be exact, six-tenths of 1 per cent. of the energy in the gas was developed as light, and that all the rest was thrown away as heat, which of course was not the object in burning gas. I pointed out that the Welsbach invention was an improvement in the right direction, and, admitting that it had not yet reached the point which would render it commercially successful, and that it was not yet quite good enough, it was nevertheless a great step in the right direction, since it showed, by the most conservative measurements, fully six times as large a yield of light energy; that is, over 3 per cent. of the energy present in the gas was developed as light, instead of about one-half of 1 per cent.

That, therefore, what was to be looked for in the future was some improvement, which so far appeared to be in the direction of an incandescent substance used for producing light. I likewise stated that the electric light was handicapped by the uneconomical character of the prime motor, the steam engine; that in the average steam engine of the day we were getting only 5 per cent. of the energy present in the coal, though under very favorable conditions we might get 10 per cent; and, therefore, that we were throwing away 90 or 95 per cent. of the total energy of the coal. This gave to gas a good chance, besides the enormous margin which it had in possible improvements in burners.

You will all remember that a few years after 1890 (I do not remember the exact date) there was brought out the new development or discovery by Dr. Auer von Welsbach of the use of thoria with a small amount of other substance, by which he greatly improved the power of his light, which, instead of yielding 10, 18 or 20-candle power, now gave 40 or 50 candles. By this improvement he just bridged the difficulty which was incident to the Welsbach light as first brought out, namely, that it was just not bright enough to satisfy the public, just not bright enough to make up for its inferiority, to the ordinary eye, in that it gave a white light in place of what people had been accustomed to; namely, a warm, yellowish light. If you substituted this white light, notwithstanding its resemblance to daylight, it did not seem so bright as a yellowish or reddish light, even though the latter were of inferior candle power. This was not to be wondered at, for, with the white light we naturally made a comparison with daylight, and thought we saw something enormously inferior when we realized that the light was white; but, when it was a reddish or a yellowish light, we no longer made an unconscious mental comparison of the light with daylight, but compared it with firelight, with lamps, or with candle light, and felt that it was good. That improvement, by raising the candle power to a greater degree, just bridged the difficulty, and made the light popular.

Since that time the development in our artificial lighting has reached

1. See JOURNAL, Jan. 2 and 16, and Feb. 8 and 17, 1879.

out still further and in various directions. The electric light has improved in a number of regards. There is, however, no burner or lamp of electric character yet produced which is notably better than we had 10 or more years ago. They may be made cheaper, a trifle more efficient and a little more enduring, etc.; but the improvements have been small. There have been, however, great improvements in the art of distributing electricity, so that we can now send it to great distances on moderate sized conductors with very little loss. In what is known as the alternating system, and in various methods of transforming and converting electric energy, the improvements have been vast and wonderful. I could not, in the limited time allowed me, even touch upon these, but you all know the wonderful way in which electricity may be transferred backward and forward, and by transformers changing a current from high to low intensity, and then from low to high again, as may be required, just as may be convenient or economical. One is very much impressed by this in visiting a building like that of the Postal Telegraph Company, where they do everything by electric power, and nothing by the old-fashioned galvanic battery. I was told by the manager that they did not have a battery in the place. The elevators are run and the messages are sent by electricity. They have very large dynamo machines, which are run by a steam engine, and that give the supply of electricity; this again is made to run motors; those motors are made to run other dynamo machines, and this thing is repeated over and over again, changing the current of those dynamos so as to adapt them to various special uses—here on the telegraph lines, or there on the elevators, or again for operating lamps. These changes and transformations back and forth are made with what one might almost call reckless readiness, and as many times as it happens to be convenient; and the convenience may be simply the avoidance of a large sized wire, or some such thing as that, for the change can be made with so little loss of energy as still to be economical.

That has been the direction up to date in which the lighting by electricity has gone. The improvements have been chiefly in the matter of distribution. The addition of the storage battery plant as an equalizer has also been along this line, so that all great central stations now have a large storage battery plant merely for the purpose of steadying the flow of the current, which they find of advantage in prolonging the life of the lamps, and in getting over the excessive draughts which will occur for an hour or so at certain times of the day. To accomplish that they can afford not only the expense of a storage battery, in any large plant, but the loss which is involved in using it; for the battery, like all the other transformers of electricity, have a wonderfully small loss. That is, the electric force lends itself to change or transformation with little loss, and in a way which is phenomenal as compared with any other force of which we know.

By these means the electric light has advanced and is advancing; and I may say, without betraying any confidence (as I am specially consulted in the development of patents in that direction), that there is in the near future possibly an improvement in that direction, to which I may briefly allude in this wise. Very early in the production of incandescent electric lamps it was thought by many inventors that the element osmium, which is somewhat like platinum, but with a yet higher resistance to heat, would be an admirable substance for an electric light, to replace the carbons of the arc light, or to replace the carbon filament in the incandescent lamp. But all who tried it were met we may say by this fact. Osmium, just because it is so exceedingly resistant, so infusible, cannot be handled; you cannot draw it into wire, you cannot fuse it or make it into anything. The only way it can be used is by the process of welding, which does not involve getting it into a fluid, but merely getting it into a soft condition, in which by the hammer it can be compacted; but you cannot draw it into wire, or get in any way a fine filament from it. It is too brittle, it breaks, cracks and splits in such a way that nothing can be done with it. Although many suggestions were made, and many experiments tried, nobody could manage with it. Now Welsbach, following out the idea in the line of his original invention of the mantle, takes a salt of osmium, saturates a thread with it, then burns away the thread in a peculiar atmosphere so as not to affect the osmium itself, and thus leaves a fine filament of osmium in a thin and elastic condition—just as he burns away the thread in the ordinary mantle and leaves the oxide of thorium in a tough but resilient condition, although in the shape of fine thread. It was something which could not be predicted; something which was entirely a surprise in that case, as it is in this.

Now, it is possible that by the development of this new discovery we may have incandescent electric lamps which will be considerably more efficient than they are at present; but, as I said in reference to the first development of the electric light, this is a thing which has to grow; still here is a direction in which it may grow and result in a more efficient electric lamp.

At present, as we all know, there is no longer a substantial separation in business relations, and no severe antagonism between those who are engaged in the business of lighting by electricity and those who are lighting by gas. In many cases the gas companies have absorbed the electric light companies, so that the two are now in the same body; and even where there are still conflicting interests we can see that wherever there is prosperity, development or evolution going on in one direction, there is likewise a similar development going on in the other direction. In the case of gas I think that development divides itself in this way: First, in the burner itself. A good many small improvements have been made in these which have led to a more extended use. When the Welsbach burner first came out one of the chief drawbacks to its use by the public at large was the fact that it required a certain amount of manual skill or dexterity to place a new mantle in the lamp if one gave out. So that if a gentleman had in his house a number of Welsbach burners, and at a critical time one or two got knocked down, or broke, or for any other reason failed, he would have to send for a gasfitter to have them replaced. He could not do it himself, as he would put a fresh candle in a candlestick, or the like. Quite recently a development has been made in this direction which I think relieves this difficulty entirely. Mantles are now made and sold which are not only supported on a little straight wire, but with a collar below which contains a wire gauze, so that when a mantle is to be replaced all that the user has to do is to take it out of the box in which it is sold to him and slip the collar at the bottom of the iron wire over the end of the burner. He has only to take out the old one, slip on the new one, put a light to it, and the thing is done. That is something anybody can do. Any child can do it. In inserting the mantle he does not need to think of more than one thing. With the old mantle he had to slide in the rod, then turn a set screw to fasten it at the right height, etc., which very often led to the breaking of the mantle and the irritation of the operator, which was very unfavorable to the continued use of the burner. Second; improvements are being made from time to time (I cannot detain you long enough to go into all of them) in the composition and manufacture of these mantles, so as to give them longer life and greater efficiency. With these developments I think the use of gas can be expected to fully keep pace with the developments on the other side—of the electric source of light.

Then, again, we have opening to us another field which in a way interests the gas manufacturer. At first it might seem as if it was an enemy; and yet, just like the Welsbach invention, which was at first, I know, looked upon very much askance by gas manufacturers, who thought it might hurt their business, but have not found it to do so. I think that this, if properly taken hold of, and grasped firmly, will not prove an injury but of service. I refer to the use of kerosene or of hydrocarbons of some sort, directly in connection with Welsbach mantles and incandescent lighting. This is illustrated, as far as it has been carried out in various forms of lamps specially adapted to exterior illumination, as for lighting streets and possibly for lighting large spaces in buildings. When two mantles are burned side by side in one globe, and a large space illuminated, and an identically large space illuminated by an ordinary electric arc light, the sense of illumination is greater with this incandescent kerosene burner than it is with the electric arc light. So that for such uses it is valuable, and will come in as one of the new methods of illumination and will have its field. Not that it will in any way or shape replace the use of gas, but it will add to this use as I believe. Where these burners are to be set out of doors, or in any other place, it is found advantageous to have a gas supply alongside for use in starting the light, which requires a certain manipulation to get it going. It requires that the little chamber, or tube, in which the gas from kerosene is first developed in the burner shall be heated in order to start the burner; and so they have to employ either a powerful torch or other means of supplying an initial heating.

I can explain in a word or two, to some of you who may not be familiar with it, just what this structure is. It amounts to this. Reservoirs are provided for containing kerosene. Air pressure is produced on the reservoir so that the kerosene may be driven out under considerable pressure, say 50 or 60 pounds to the square inch. But very little air is used, because you are not drawing the air out, but only displacing the liquid by air. A man in a few minutes with a hand pump can charge one of these reservoirs without difficulty, the time required depending upon how many lights the reservoir has to supply. The kerosene supplied in this way under pressure is then led through fine tubes, which look exactly like copper wires, and are no bigger than bell wires, and is delivered to each center of illumination. These wires are strung

much as you would string a copper wire as an electric conductor, only they are very much smaller wires than are needed in arc lights. Then at each lamp there is a needle valve controlling a very small aperture, through which the kerosene is fed into a horizontal tube which is immediately above the burner. Into that tube, as soon as said tube has been heated, the kerosene is immediately vaporized, and then descends and comes out through another small aperture in the center of a large tube, into which, by coming out with some force, it draws air, upon just the principle of the exhaust on a locomotive, and gives a blast of mixed air and kerosene vapor up through the burner, which is just like the ordinary Bunsen burner of the Welsbach. The mantle is thus made intensely hot. This blast makes some noise, which is of course a thing to be remembered, inasmuch as such a burner would not answer for a room such as this, but is not objectionable in a railroad depot or on the street.

In this direction I think there is something developing and to be taken account of, and not to be entirely ignored, but at the same time to be taken account of very soberly, and as one of the many things which are adding to the comforts and conveniences of life, without displacing the older forms which have served us previously.

Then, again, developments are being made (although the point has not reached a practical shape) in the use of kerosene for lighting directly in an ordinary lamp, but under the Welsbach mantle. The kerosene vaporizes in the lower part of the lamp by the heat of the burner, simply by the radiant heat, vaporizing from the upper end of the wick, then mixing with air that comes up over the Welsbach mantle, thereby heating it and giving out light. I have seen some of these lamps, which for many hours and days have operated successfully, but I am disposed to feel an uncertainty as to their permanency, and as to their meeting the severe requirements of the public that anything they are to use must need no care at all. This is one thing that has to be taken into account in this direction, as in a great many others, for we cannot expect the average man to take any trouble with anything that he is going to use. It must be something he can go to at any time, like a gas lamp, scratch a match and have a light; it must not need adjustment; it must be always ready and always going. This is a very severe requirement in many cases, but it is one that we must face. I think it has been exactly that lack of uncared-for efficiency which has prevented the development of the phonograph into general use. Of course we know that it now has a certain use as a means of amusement; but in getting people to use it in their offices for dictating letters, etc., as was proposed at first, it has made no success. And that is merely because you cannot get people to take the trouble that is involved in the use of the phonograph for ordinary purposes. They must have something like a pen and inkstand, which will always be there and ready for use with no thought or need of doing anything but to take up the pen and write. It may be that in the future our descendants may reach such a development that they will be able to dictate to the phonograph automatically and unconsciously, just as we now write unconsciously with the pen; but until that preliminary education is reached I think we can hardly hope for its success. And we must keep in mind the same thing with regard to any contrivance intended for the use of the public. We must take into account the innate—we may hardly call it laziness—but the indisposition to give thought or trouble to anything which is to be used frequently.

In connection with the development of the incandescent burner of the Welsbach type, you know also of other burners which involve the following condition: In order to increase the efficiency of the gas burned in the Welsbach lamp we need a higher temperature, just as in the incandescent electric lamp. If the new osmium lamp is a success it will be because we can make the osmium filament hotter than we were ever able to make the carbon filament; for we know that if we raise the temperature of the carbon filament beyond a certain point it breaks. It is believed that the osmium filament can be raised several degrees higher than can the carbon, and a very few degrees higher at that point will make a very great difference in the amount of light emitted. It is the same with the Welsbach lamp. If we could heat the mantle a few degrees higher than we now do, we would be able to get a great deal more light. The only way of doing that is by a regenerative process; that is, by heating the air, or gas, or both, on their way to the burner, on the principle of the Siemens' regenerative furnace, and so getting a higher temperature in the burner, or by mixing them in a blast, and thus securing a more rapid consumption of the fuel. These principles may be carried out in a great variety of constructions.

I should neglect an important subject if I did not in this connection refer, at least, to another source of light which has come in within the last 10 years, and that is acetylene. You all know about acetylene, the exceeding brilliancy of its flame, the methods by which it is produced from the carbide of calcium, etc. When this first came out, like other new inventions, it was boldly announced that it was going to "wipe out" every other means of illumination, and that the gas companies might just as well shut up, or else come into the combination and buy rights under the Acetylene Company, or whatever it was called. These results have not come about; and although acetylene is used to a considerable extent, it has not, so far as I have learned, interfered with the older sources of light. It has its uses. There are locations where it is not convenient to obtain gas, as in private houses in the country, or where it is desirable to have a very brilliant light, where acetylene may come in; but it meets with several difficulties, one of which I have just alluded to, and that is the necessity of care and oversight in looking after it. I think that is quite an obstruction. People are very unwilling to use anything which they must look after in order that it may not go out or give them trouble. Then, again, comes the question of cost. And while there are locations and conditions under which that consideration may be insignificant or negligible, and so not interfere with the introduction and use of acetylene, as where an intense source of light is desired, yet it is not very difficult to demonstrate that there is little or no hope that, even using the power of Niagara as a cheap source of power for its manufacture, the cost can be brought down to any point where it can compete with gas made with the improvements which have been introduced during the last ten years in its manufacture, and by which it is cheapened. So that acetylene, while it is a factor to be considered, and is not a trifling factor in the situation, need not cause you any anxiety as a revolutionary element.

One other point that I want to call to your attention in this connection is the change which the introduction of the incandescent light has made in relation to the manufacture of gas. One is the disappearance from the problem to some extent of the conditions existing ten years ago, and prior to that, of the necessity of giving a very high illuminating power to gas. Using these incandescent burners, gas of low illuminating power is substantially as good as gas of high illuminating power; at all events the difference is not worth the money involved in making gas of higher illuminating power. So that in the future we must look for processes of manufacturing and distributing gas of lower illuminating power, and hope that it may be made cheap enough to be employed as fuel, for that is one of the things which we can see is coming. And in this connection I may say that enormous strides have been made in the development of new processes, not only in the point which has been reached in this country in the first instance, of efficiency in water gas apparatus (and with which your President has had so much to do), but in the developments in gas production involved in the new process for manufacture of coke, or where coke is to be considered the chief product, and gas as a sort of residual. You all know what has been done in that direction. You know how extensive are the works in Boston and elsewhere which have been built upon this principle. This is another of the things which have recently come to pass, which bear upon the question of gas lighting, and which must not be forgotten or overlooked, but taken into account in connection with other developments of the subject.

I think I have now touched upon all the matters which occurred to me as possibly of interest to you—not because I hoped to give you information in any detail upon the subjects, but only to draw attention to certain principles which my experience of 30 years has strongly borne in upon me, namely, that it is important to look with a conservative coolness upon new developments, and not allow ourselves to be alarmed or carried away because something promises great things in the future, but remember that time must be given for the development of everything; and that while a new-born baby may grow, the babies who are older, and who have even already reached manhood, can also grow; and that even the mature man can continue to grow stronger and become wiser, as well as the child.

Having finished the lecture, President Morton took his seat to the accompaniment of great applause. On motion of Mr. Paul Doty, a hearty vote of thanks was tendered to President Morton.

The President announced that Messrs. Eugene Vanderpool, A. B. Slater and C. H. Nettleton had been appointed as the

Committee to Award the Beal Medal.

Capt. W. H. White then presented the

Report of Committee on Next Place of Meeting.

In well chosen words the Captain declared that the choice of the Committee was Denver, Col. The report was received and adopted. The vote, however, was not unanimous.

REPORT OF COMMITTEE ON PRESIDENT'S ADDRESS.

Mr. C. F. Prichard here read the report of the Committee on President's Address, which report was endorsed by vote in the regular way.

Mr. F. N. Morton then read his paper on

ANOTHER VIEW OF INTERIOR ILLUMINATION.

[For the text of Mr. Morton's paper, see JOURNAL, October 23, page 650.]

[To be Continued.]

Some Experiments with the Edgerton Standard.

[A paper read by MR. ROLLIN NORRIS, of Phila., Pa., before the Twenty-seventh Annual Meeting of the American Gas Light Association.]

The necessity of sending to our consumers a gas of nearly constant candle power calls for frequent and reliable photometer tests on the gas as it is made and delivered to the storage holders, and as it leaves the works; and, in order that these tests may serve their purpose, it is obvious that our apparatus must be such that we can get determinations which are rapid and at the same time substantially accurate.

For practical operating conditions rapidity is of even more importance than absolute exactness, for if the test shows that the candle power of the gas is not what is wanted, the remedy must be applied at once.

It is of very little help to one's efforts to keep gas of a constant quality to know that, some hours before, the gas was two or three candles above or below its standard value.

Of course an instrument giving continuous readings would be the ideal arrangement; but, unfortunately, the jet photometer, the only instrument we have that claims to show candle power at a glance, does not measure candle power at all, no matter what may be its other virtues, or its incidental advantages as a more or less rough indicator. We are consequently forced to use the bar photometer for accurate work.

The standard of light, a candle power, is the average light given by candles of certain specified proportions and composition, burning at a certain specified rate. The most natural way of measuring the quality of the gas would, therefore, be to test it against candles directly; but it unfortunately happens that the light given by standard candles per unit of sperm consumed varies from moment to moment, and a single 10-minute test against candles does not give a result whose accuracy can be relied upon.

Continual efforts have, therefore, been made by gas engineers to get a secondary standard which could be put into almost instant use, whose value would remain constant, and which could be standardized from time to time against the ultimate standard, sperm candles.

With such an instrument the standardizing tests against candles could be made to cover a large number of conditions of temperature, barometric pressure, etc., and by using a dozen or so different candles, and spreading the tests over a period of several weeks or months, the resulting value of the secondary standard would be very fairly expressed in terms of the actual average light given by a standard sperm candle. The tests made against such a secondary standard would be much more accurate than even two or three tests taken directly against candles, not to mention the saving in time and the annoyance of candles refusing to burn 40 grains of sperm within the specified limits of time. Of course the usefulness of such a secondary standard depends upon its having a substantially constant value.

The more prominent examples of secondary standards are the Methven Screen, the several Pentane lamps, and the so called "Edgerton" or "Mobile" standard. This last standard, the Edgerton, has been used by a large number of gas companies in this country, on account of its simplicity, low cost and supposed constant value. The endeavor to find out how reliable this Edgerton standard is, and between what limits, burning gas of different kinds and qualities, has led to the experiments that will be detailed in this paper.

These experiments are not submitted as an exhaustive investigation of the subject, but they represent the actual conditions arising in the practical daily operation of different gas works, using a variety of processes and materials, and, as far as they go, may be relied upon as having been carefully and conscientiously made.

Almost all the actual photometric work in the first set of tables was done by one of my assistants, Mr. F. A. Welles, M. E., and if any errors of observation or adjustment have crept in, they are such as would be liable to occur with any skilled observer, and so are a part of the experiment.

The standard of comparison in the experiments was the Harcourt, 10-candle power pentane lamp,—the instrument that was adopted last year by the Metropolitan Gas Referees, of London, as the standard of light for their photometers, and which I have assumed, and I think safely, to give a constant standard for the experiments.

The value of these figures is not affected by the question of whether or not the pentane lamp was exactly 10 candle power. As a matter of fact, however, the average of over 1,000 observations against candles, under varying weather conditions, gave the lamp a value of 10 03 candles, and I have assumed 10-candle power as its value.

Some of my experiments were made with a second lamp—the one exhibited here—which I have called lamp No. 2 below. This lamp, tested against lamp No. 1, showed a value of 10.24 candles, and the readings against this lamp have been reduced to the basis of lamp No. 1.

The Edgerton standard consists of an ordinary 24-hole, Sugg D Argand burner, with a 7-inch glass chimney, and with a blackened brass sleeve surrounding the glass chimney. In the sleeve is cut a horizontal slit, $\frac{1}{16}$ inches high, with its lower edge $\frac{7}{8}$ inch above the top of the steatite burner.

The theory of the standard is that if the flame be adjusted to a height of 3 inches the horizontal section visible through the slit described above will be of a practically constant value for all ordinary variations in the candle power of the gas supplied to it.

Water Gas in Edgerton Standard.—The first set of observations was against water gas, and I give the results in detail, each value given being the average of at least 20 observations.

TABLE I.—*Value of Edgerton Standard, Using Water Gas.*

Works A. Lowe Sets, Naphtha Anthracite.		Works B. Lowe Sets. Gas Oil Gas Coke.		Works C. Wilkinson Sets. Naphtha Gas Coke.	
C. P. of Gas.	C. P. of Edgerton.	C. P. of Gas.	C. P. of Edgerton.	C. P. of Gas.	C. P. of Edgerton.
20.22	6.25	18.8	5.99	21.5	5 82
20.40	6.29	21.7	6.06	22.5	6.10
20.75	6.29	22.4	6.13	23.1	6.17
20.92	6.28	22.7	5.94	23.2	5.95
21.13	6.27	23.7	6.03		
22.50	6.27	23.9	5.88		
Gas Oil.		24.6	5.59		
	6.21	24.8	5.72		
	6.29	25.0	6.05		
	6.32	25.3	6.22		
	6.40	25.6	5.84		
23.35	6.21	25.8	5.88		
23.35	6.20	26.5	6.24		
		27.3	6.15		
		27.8	6.13		
		27.8	5.83		
Average....6.27		Average....5.99		Average....6.01	

We thus have for the three works average values for the Edgerton of 6.27, 5 99 and 6 01 candle power respectively; a difference between the highest and lowest of nearly 5 per cent.

At works A the highest value was 6 40-candle power and the lowest 6.20 candle power—a range of from about 2 per cent. above to 1 per cent. below the average of 6.27 candle power.

At works B the highest value was 6.24 and the lowest 5 59—a range of from 4.2 per cent. above to 6.7 per cent. below the average of 5.99 candle power.

At works C only four tests were made, showing a variation of about 3 per cent., above and below the average of 6.01-candle power.

It is evident from the above figures that the Edgerton standard does not have a constant value at different works, or a constant value at the same works, and the error is greater than I had anticipated. At works A, where the candle power and results are watched much more closely than at works B, the value of the standard is fairly constant, the variation, with the exception of one test, being within about 1 per cent. each way. Averages of four readings, however, as reported in Table VI., showed more variation than this at works A.

But under works B conditions, the Edgerton is evidently unreliable. It might be well to state, however, that the variations in candle power of the samples of gas tested at this works were obtained by drawing

into a test holder, during different parts of the run, samples of gas on the way to the relief holder, the oil feed being temporarily increased for the richer samples.

It is a notable fact that even at works B, though the value of the standard varied within quite wide limits, these variations were independent of the candle power of the gas itself, and the average value, using gas of from 18 to 22-candle power, was practically the same as when using gas of from 26 to 28-candle power, a variation of 9 candles in the gas supplied to the Edgerton.

Coal Gas in Edgerton Standard.—The next experiment was to try coal gas in the standard. The results are given below. It may be remarked that the candle power of the gas as given was measured on the ordinary flat flame burner, and that the gas was purified with oxide only.

TABLE II.

Works A.		Works B.		Works C.	
C. P. of Gas.	C P. of Edgerton.	C. P. of Gas.	C. P. of Edgerton.	C. P. of Gas.	C. P. of Edgerton.
14 4	4.32	13.2	4.36	12 65	4.48
15.0	4.41	14.7	4.65	12.74	4.52
15.0	4.39	14.74	4.60	13.32	4.48
15.07	4.55	....	....	....	....
15.27	4.39	....	....	....	....
16.6	4.58	....	....	....	....
Average	4.44	Average	4.54	Average	4.49

The experiments with coal gas were not as numerous as those with water gas, but as far as they went they indicate that the Edgerton is slightly more reliable with coal gas than with water gas. The three works agree within 2.3 per cent.

At works A, with a variation of 2.2 candles in the gas used in the standard, the value of the standard varied from 2.7 per cent. below to 3.2 per cent. above the average of 4.44 candle power.

At works B the total range was about 5 per cent., and at works C, under 3 per cent.

Mixed Gas in Edgerton.—No experiments were made with mixed gas in the Edgerton, but as its value with coal gas was about 4½ candles, and with water gas about 6 candles, it is evident that with mixed gas of varying proportions of coal gas and water gas, the value of the Edgerton would fluctuate widely.

Variations in Height of Flame in Edgerton.—The height of the flame in the Edgerton was varied a quarter of an inch at a time, between 2½ and 3½ inches, and the effect on the value of the standard is given below. The tests were made in the order indicated, and each value is an average of 10 readings. The gas used was from the outlet of the relief holder and probably averaged about 23 candle power.

TABLE III.—*Height of Flame.*

2.50-inches.	2.75-inches.	3.00 inches.	3.25 inches.	3.50 inches.
C. P.	C. P.	C. P.	C. P.	C. P.
6.39				
	6 29			
		6.21		
			6.15	
				6.08
				6.08
			6.26	
		6.29		
	6.45			
6.51				
6 51				
	6 45			
		6.32		
			6.26	
				6.21
				6.06
			6.23	
		6.40		
	6.48			
6.68				
Av'ges, 6.52 C. P.	6.42 C. P.	6.31 C. P.	6.21 C. P.	6.11 C.P.

A similar series of tests resulted as follows :

TABLE IV.—*Height of Flame.*

2.50 inches.	2.75 inches.	3.00 inches.	3.25-inches.	3.50-inches.
C. P.	C. P.	C. P.	C. P.	C. P.
6.32				
	6.31			
		6.21		
			6.15	
				6.03
6.38				
			6.14	
	6.29			
		6.20		
Av'ges, 6.35 C. P.	6.30 C. P.	6.21 C. P.	6.15 C. P.	6.03 C.P.

It is evident that considerable care must be exercised in getting the flame adjusted to exactly 3 inches, and even then the value of the standard is liable to vary considerably.

In addition to the tests detailed above, I give below a series of observations made at works A, over a considerable period of time, taking the gas as made. These observations were made by three different observers—young men whose sole duty is to take candle power in the ordinary operation of the works. The values given in this table do not, as in the previous tables, represent the averages of 10 to 20 readings, but each is an average of four readings.

It is to be especially noted that the Sugg, D-Argand used with the Edgerton sleeve in this case was slightly different in design from that used in the other tests, which accounts for the difference in the average observed values of the Edgerton in the two sets of experiments.

This difference in the burners used was not discovered until the tests were completed, but the value of the tests is not affected in any way thereby

TABLE V.—*Coal Gas in Edgerton.—Sugg. D. M. Burner.*

C. P. of Coal Gas.	C. P. of Edgerton.	C. P. of Coal Gas.	C. P. of Edgerton.	C. P. of Coal Gas.	C. P. of Edgerton.	C. P. of Coal Gas.	C. P. of Edgerton.
16.8	4 77	15 9	4.46				
		do	4.41	14 8	4.44	13 8	4 02
16.6	4.72	do	4.41				
		do	4 36				
16.7	4.52	do	4 44	do	4 42		
		do	4.46				
16.6	4.54	do	4 44				
		15 8	4 41	do	4 54	13 6	4.17
16.5	4 63	do	4.41				
		do	4.48				
do	4.66	do	4 41	14 7	4.25		
		do	4 66				
16.3	4.57	do	4.43				
		15.7	4.54	do	4.46	do	4.53
16.2	4.52	do	4.63				
		do	4.52				
do	4.54	do	4.52	14.5	4.17		
		do	4.18				
do	4.49	do	4 54	do	4.45	do	4 53
		do	4 67				
16.1	4.52	do	4.36	14.4	4.30		
		15.6	4.52				
do	4.52	do	4.40				
		do	4 40	do	4 22	13 5	4.23
do	4.41	15 5	4.46				
		do	4 46	14 3	4.67		
do	4.63	do	4 45				
		do	4.48	14.2	4 33		
16.0	4 52	do	4.48				
		do	4 38	14 0	4.24	13.4	3 98
do	4 49	do	4 40				
		15 4	4 48	do	4 13		
do	4.69	do	4.54				
		15.3	4.46	do	4.50		
do	4.54	do	4 27				
		15 2	4 28	do	4 36		
do	4.37	do	4 32				
		do	4 37				
do	4.44	15.1	4 28	do	4.25		
		do	4 34				
do	4.41	do	4.46				
		15.	4.34				
		do	4.48				
Ave.....4 55		Ave.....4 45		Ave..... 4.36		Ave.....4 24	
Range, 4.37 to 4.77 C. P.		Range, 4.27 to 4.67 C. P.		Range, 4.13 to 4.67 C. P.		Range, 3.98 to 4 53 C.P.	
Error, — 0.18 to + 0.22		Error, — 0 18 to + 0.22		Error, — 0.23 to + 0.31		Error, — 0 26 to + 0.29	

Excluding the gas below 14-candle power, we have, for all the coal gas tests above, an average value of 4.46-candle power, and a range of error from — 0.33 to + 0.21-candle power. In other words. the maximum error due to the use of the Edgerton in measuring coal gas of from 14 to 17-candle power would be about 1¼ candles.

The value of the Edgerton with coal gas evidently varies with the quality of gas used, decreasing about one-tenth of a candle for each reduction of 1 candle power in the gas used. This average difference, however, is much less than the variations between individual results, using gas of the same candle power.

TABLE VI.—*Water Gas in Edgerton.—Sugg, D. M. Burner.*

C. P. of Water Gas.	C. P. of Edgerton.	Error.
18.1	5.09	— 0.46
20.4	5.72	+ 0.17
20.7	5.55	0.00
20.7	5.88	+ 0.33
21.1	5.85	+ 0 30
21.7	5.78	+ 0.23
21.8	5.95	+ 0.40
24.0	5.26	— 0.29
25.2	5.26	— 0.29
25.4	5.55	0.00
25.8	5.32	— 0.23
25.8	5.98	+ 0.43
26 0	5.40	— 0.15
26.2	5.16	+ 0.39

Average, 5.55-candle power; range, 5.09 to 5.98 candle power; error, — 0.46 to + 0.43-candle power.

The range in error in the above values of the Edgerton is greater than is shown in the more carefully conducted experiments detailed in the first part of this paper, but they show very clearly that the average value of the Edgerton with water gas does not vary with changes in the candle power of the gas supplied to it, but that individual tests will vary considerably from each other.

Referring to the Edgerton standard in its present design, the general conclusions to be drawn from the experiments which I have dedetailed above are that with water gas the value of the Edgerton is independent, within wide limits, of the candle power of the gas used in it; that with coal gas the value varies with the value of the gas burned, the change being about 10 per cent. of the change in value of the gas used; that with either coal gas or water gas, if the Edgerton be carefully standardized for the conditions under which it is to work, it may be relied upon to give results whose error will not exceed 1½ candles, while a large majority of the observations will be correct to within 1 candle of the true value of the gas.

For more accurate work than this I think the most satisfactory standard available is the Harcourt, 10 candle power pentane lamp, which was used as a basis of comparison in my experiments. The evi dences in favor of this lamp are many. It burns the vapor of liquid hydrocarbons consisting almost entirely of pentane (C_5H_{12}); and it has been found by experiment that the height of the flame may be varied through quite a wide range without affecting the value of the standard.

This lamp comes to us with the authority of the Metropolitan Gas Referees of London, who have adopted it as the standard of light for the photometers used in the official measurements of the gas supplied to London, the use of candles having been abolished entirely. Moreover, in this country, lamps made by the American Meter Company following the specifications given in the Referees' Instructions, issued in the summer of 1898, have satisfactorily stood the test of practical, everyday working at one of our larger works. This works is equipped with three of these lamps, and the tests made on them against the same gas have been found to agree invariably.

The first pentane lamp obtained was installed at a testing station situated a mile from the works on the principal supply main to the city, while at the works the Edgerton standard was used. The candle power results at the testing station made against the pentane lamp, were found to vary considerably and erratically from those made at the works against the Edgerton. Finally, a second pentane lamp was obtained and installed at the works, and since then it has been found that the readings on the two photometers invariably agree within a small frac tion of 1-candle power. As this has been going on for months, it shows clearly that the two lamps give lights which are practically indepen dent of the accidental variations in the temperatures at the two testing stations, and of the quantity of pentane in the oil reservoirs of the two lamps.

I have here the pentane lamp which was used in these experiments. It differs from the English specifications only in having had substituted a brass tube in place of the rubber tube for conducting the mixture of pentane vapor and air from the saturator to the burner.

As a matter of general interest, I have attached an appendix to this paper giving extracts from the London Referees' notice, including a description of the standard Harcourt, 10 candle power pentane lamp, together with their instructions for the preparation of pentane for use in these lamps. The pentane used in my experiments was obtained from the Atlantic Refining Company, which was furnished with a copy of the Referees' instructions, and these it followed in the preparation of the distillate.

Returning now to the pentane lamp which we have used, I give below in detail the results of a series of tests of the value of the lamp as compared with candles. Each value given represents a 10 minute test, and all tests were rejected in which the rate of burning differed more than 5 per cent. from the standard rate. The candles used were those which in our practice we have found to give the most uniform results. They are obtained through one of the meter makers who import them from England, and they are what is known as the "B.T.S." candle, or British Test Standard.

TABLE VII.—*No. 1 Pentane Lamp vs. B. T. S. Candles.*

Observations by C. C. Tutwiler and H. Livingston.

1898.	C. P.	1898.	C. P.	1898.	C. P.
Nov. 10th	10.22	Nov. 11th	9.82	Nov. 17th	9.84
	10.26		9.88		10.24
	10.22		9.64		10.02
	9.20		10.24		10.36
	10.00		9.98		10.16
	9.94		9.36		10.12
	9.82		10.62		9.96
	10.62		10.26		10.02
	10.30		9.52		10.18
	10.68		9.72		9.82
	10.22		9.84		10.02
	11.00		10.58		9.94
	9.90		10.26	Nov. 18th	9.84
	9.84		10.22		9.68
Nov. 11th	10.24		10.30		9.96
	9.92	Nov. 12th	10.18		9.90
	9.78		10.28		9.84
	9.90		10.02		9.78
	9.70	Nov. 17th	9.96		9.68
	10.08		9.92		10.22
	9.90		9.86		10.10

Average value, 10.03-candle power; range, 9.20 candle power to 11-candle power.

In addition to the above figures, which bring out very fairly the wide variation in the light given by standard candles, some tests were made against lamp No. 2, whose value as compared with lamp No. 1 is 10.24-candle power. Using one set of candles the average of 8 ten-minute tests gave the pentane lamp a value of 10.72-candle power, while another set of candles gave, on 5 ten-minute tests, an average value of 9.96-candle power.

For very accurate work it seems that the pentane lamp is the most satisfactory and reliable standard that is now available, but the fact that the Edgerton gave values that averaged the same with any candle power of water gas supplied to it, leads to the hope that possibly it may be improved by some modification of its design or of the conditions of its use. The gas used in my experiments was in every case purified with oxide only, and so carried a variable amount of carbonic acid. It may be that the removal by a test lime purifier of the CO_2 in the gas supplied to the Edgerton may result in its giving more uniform values and it is proposed to make some further experiments in this line, and also with different proportions and locations of the slot in the screen.

But whether or not these experiments result in improvement in the Edgerton, the pentane lamp is the most promising "court of final resort," and further tests will be made with it to see whether under our conditions it will continue to be satisfactory and repeat the good record it has established in England. If these experiments warrant it, I propose bringing the matter before this Association and asking it to take some action to confirm the accuracy of the lamp, and to give it their official sanction as the standard of light.

If the Association sees fit to follow up this suggestion, it will doubtless decide at the time whether it can best be done through the Committee on Research or through a special committee to be appointed for the purpose. Some official action on the standard is needed, and the

American Gas Light Association is, I think, the proper body to undertake this work.

Harcourt's 10-Candle Pentane Lamp.

Appendix.

Extracts from Instructions of the Municipal Referees, London, England—1898.

The Ten-Candle Pentane Lamp.—Mr. Harcourt's 10-candle pentane lamp is one in which air is saturated with pentane vapor, and in which the air gas so formed descends by its gravity to a steatite ring burner. The flame is drawn into a definite form, and the top of it is hidden from view by a long brass chimney above the steatite burner. The chimney is surrounded by a larger brass tube, in which the air is warmed by the chimney, and so tends to rise. This makes a current which, descending through another tube, supplies air to the center of the steatite ring. No glass chimney is required. No exterior means have to be employed to drive the pentane vapor through the burner.

Fig. 1 shows the general appearance of the lamp. The saturator A is, at starting, about two-thirds filled with pentane.[1]

It should be replenished from time to time so that the height of liquid as seen against the windows may not fall below one-eighth of an inch. The saturator, *A*, is connected with the burner, *B*, by means of a piece of wide indiarubber tube. The rate of flow of the gas can be regulated by the large stopcock, S^1. The large stopcock, *S*, for admitting air should be fully open when the lamp is in use. Both should be turned off when the lamp is not alight.

The chimney tube, *C*, should be turned or screened so that no light passing through the mica window near its base can fall upon the photoped. The lower end of this tube should, when the lamp is cold, be set 47 mm. above the steatite ring-burner. A cylindrical boxwood gauge, 47 mm. in length and 32 mm. in diameter, is provided with the lamp, to facilitate this adjustment. The exterior tube, *D*, communicates with the interior of the ring burner by means of the connecting box above the tube, *E*, and the bracket, *F*, on which the burner, *B*, is supported. A conical shape, *G*, is provided. This should be placed so that the whole surface of the flame beneath the tube, *C*, may be seen at the photoped through the opening.

The lamp should be adjusted by its levelling screws, so that the tube, *E* (as tested with the plumb line), is vertical, and so that the upper surface of the steatite burner is 453 mm. from the table. A gauge is provided to facilitate this latter measurement. The tube, *C*, is brought centrally over the burner by means of the three adjusting screws at the base of the tube, *D*. This adjustment is facilitated by means of the boxwood gauge.

When the lamp is in use, the stopcock, S^3, is to be turned so that the tip of the flame is about half-way between the bottom of the mica window and the crossbar. A variation of a quarter of an inch either way has no material influence upon the light of the flame.

The following are the more important dimensions on which the precision of the lamp depends; but no departure should be made from any of the dimensions as shown by the working drawings. All dimensions are given in millimetres.

Saturator A.—184 by 184 by 38 deep, inside measurement, with seven partitions alternately meeting either side, and stopping 25 short of the opposite side, to cause the air to pass eight times across the box. These partitions must be soldered to the top, not to the bottom of the box.

Siphon Tube from Saturator.—Outer diameter, 14 (½-inch full).

India Rubber Tube.—Inner diameter, 13 (½-inch).

Steatite Burner.—Outer diameter, 24; inner diameter, 14; 30 holes, each 1.25 in diameter.

Brass Chimney C.—Outer diameter, 32; inner diameter, 30; length, 431.

Brass Outer Tube D.—Outer diameter, 52; inner diameter, 50, length, 290.

Chimney C projects 65 below and 76 above the tube, *D*.

Brass Tube E.—Outer diameter, 25; inner diameter, 23; length, 529½.

Distance between axis of tube *E* and axis of tubes *C* and *D*, 67.

Shade G.—Diameter of base, 102; diameter at top, 55; height, 57; opening, 38 within, 34 without.

Pentane.—The pentane to be used in the 10-candle lamp should be prepared and tested in the following manner:

Preparation.—Light American petroleum, such as is known as gasoline and used for making air gas, is to be further rectified by three distillations, at 55° C., 50° C., and 45° C. in succession. The distillate at 45° C. is to be shaken up from time to time, during two periods of not less than three hours each, with one-tenth its bulk of (1) strong sulphuric acid, (2) solution of caustic soda. After these treatments it is to be again distilled, and that portion is to be collected for use which comes over between the temperatures of 25° and 40° C. It will consist chiefly of pentane, together with small quantities of lower and higher homologues whose presence does not affect the light of the lamp.

Testing.—The density of the liquid pentane at 15° C. should not be less than 0.6235, nor more than 0.626 as compared with that of water of maximum density. The density of the pentane when gaseous, as compared with that of hydrogen at the same temperature and under the same pressure, may be taken. This is done most readily and exactly by Gay Lussac's method, under a pressure of about half an atmosphere, and at temperatures between 25° and 35° C. The density of gaseous pentane should lie between 36 and 38.

Any admixture with pentane of hydrocarbons belonging to other groups and having a higher photogenic value—such as benzene or amylene—must be avoided. Their presence may be detected by the following test: Bring into a stoppered white glass bottle, of from 80 c.c. to 100 c.c. capacity, 10 c.c. of nitric acid, specific gravity 1.32 (made by diluting pure nitric acid with half its bulk of water). Add a few drops of a dilute solution of potassium permanganate, sufficient to give to the acid a full and permanent pink color. Pour into the bottle 50 c.c. of the sample of pentane, and shake strongly from time to time during 5 minutes. If no hydrocarbons other than paraffines are presented, the pink color, though somewhat paler, will still be distinct. If there is an admixture of as much as ½ per cent. of amylene or benzene, the color will have disappeared.

1. Pentane is extremely inflammable. It gives off at ordinary temperatures a heavy vapor, which is liable to ignite at a flame at a lower level than the liquid. *The saturator must never be filled up with pentane when in position, if the lamp is alight.*

[Prepared for the JOURNAL.]

A German Gas Works.

By MR. FREDERIC EGNER.

In the *Journal für Gasbeleuchtung* Herr Director H. Burgmann describes the new gas works of the city of Altona, from which article the following is taken.

The works, which are located in a suburb named Bahrenfeld, occupy an area of 19.5 acres. Of this area 3.21 acres are covered by buildings; .98 of an acre is paved, and 2.53 acres (not paved) are taken up as a yard, while the rest of the space is left for future extensions. In said yard there are 3,280 lineal feet of standard gauge railroad tracks, which are connected with the elevated switch from the main line of the adjoining railroad by means of a combined turntable and hydraulic lift. The switch from the main line, over which all material to and from the works is hauled, is upon a trestle 13 feet 9 inches above the yard level, and strong enough to not only bear the weight of the loaded cars but of the locomotives as well. In passing to and from the works, cars must pass over a railroad scale, upon which everything passing either way is weighed. Although the height of the tracks above the yard would cause one to infer that possibly the ground upon which the works are built was low, it is very good building ground, since the seep water or ground water line is about 23 feet below the yard level. The hydraulic lift and turntable mentioned are operated by a novel and entirely new method designed by Herr Burgmann, by means of which no water is lost. A car is raised inside of three minutes from yard to trestle, and, in the raising or lowering, is turned as desired at the same time.

These works were erected and brought into operation during the years 1894–96, and are designed for an ultimate production of 3,531,400 cubic feet of coal gas in 24 hours. The present capacity is 1,765,700 cubic feet per diem. The design provides for four independent operating sections, two of which are complete, and the buildings for the others are fairly underway. The object in dividing the works into independent sections was to obviate the stoppage of the whole works in case of an accident in any part thereof; also, in order that the additions might be handily made, as necessity called for such. Especial care was devoted, when planning, to provide means for reducing the need of manual labor to the lowest point; and to admit of easy and thorough supervision of the whole, besides the guarding against the possibility of accidents, as stated above.

The coal is brought from the main line of the railroad by switch directly into the coal sheds. Close to these sheds are the coal breakers. These are two in number, and are operated by means of two 8-horse power gas engines. The capacity of this apparatus was calculated for a production of 1,765,700 cubic feet of gas in 24 hours. The engines are arranged in such a manner that either one can operate one or both of the breakers, and as but one is required at any time it follows that the other is always a reserve apparatus, and can instantly be put at work, should a stoppage occur with the other. Either breaker can easily break 22,046 pounds (9.84 tons) per hour. The coal is broken into pieces of about 2.36 inches in diameter; and, aside from the fact that at that size the coal can be thoroughly carbonized, this dimension also insures an even distribution, by means of suitable mechanical appliances, of the coal in the inclined retorts, in which it lies in perfectly even layers. It is, of course, important to the thorough exhausting of all gas from the coal, that it should lie in the retorts at a level depth throughout.

From the breakers the coal falls into wrought iron bins, from which again it can be dropped into coal cars which can hold 3,527 pounds, by which it is brought to the retort house coal elevators. Here these cars are raised about 42 feet 6 inches and the coal is dumped into the retort feeding bins. By means of traveling charging vessels, the coal is taken from the bins and dropped into the inclined retorts.

The retort houses can accommodate two stacks with 8 benches of 9's and two stacks with 7 benches of 9's each, or 30 benches of 9's—all "inclines."

To date two stacks of 8 benches of 9's are finished (144 retorts), and one stack of 7 benches is in course of erection. Each bench has 9 retorts, after Coze's pattern; the retorts being 13 feet 3 inches long and resting at an angle of 32° from the horizontal. There is one generator furnace to each bench. From the retort house one can go into the bathing and dressing rooms of the retort house hands; while all other labor about the works is assigned similar accommodations elsewhere.

Elevator, coal storage, coal breaker and retort houses are constructed in a thoroughly massive manner, and are provided throughout with iron roofs. The raw gas is drawn by the exhausters from the retort house through a 31.49 inch cast iron main, and then *pushed* through the rest of the apparatus through the meters and to the gasholder, which last is of 1,165,362 cubic feet capacity. Each operating system consists of 2 atmospheric condensers; two air and water condensers; a washer and a Pelouze tar abstractor; two exhausters with by-pass regulators, and a set of four purifiers. The purifiers are furnished with metallic *and hydraulic* valves. The covers of the boxes are raised by hydraulic pressure. All the buildings are supplied with steam heating apparatus. Oxide is used for purification, and the regenerating floors are located between each set of four purifiers. The emptying or filling of the boxes is accomplished by means of a hanging railway. All the operating gas mains, which consist of 17.71-inch, 25 59-inch, and 31.49-inch pipes, are located on the ground floor, in well-lighted, ventilated and easily accessible situations. The tar and ammonia cisterns, which are located in the yard and in front of the water tower, are constructed of concrete, and are calculated for a daily production of 1,765,700 cubic feet of coal gas to contain 237,733 U. S. standard gallons The cisterns are built so as to form separating chambers for the automatic separation of tar and ammoniacal liquor. The gasholder is a triple lift one resting in a concrete tank.

The station meter house is opposite the office building at the entrance to the works. At present it contains but one meter of 1,765,700 cubic feet daily working capacity. In the same building are three water-weighted and regulated station governors. As there are three entirely independent gas main systems leading to the city, each of these has its separate station governor. The working capacity of these governors is, together, 3,531,400 cubic feet. In an engine house (other than the exhauster rooms) there are two 25-horse power steam engines, one of which is always in reserve; while the other actuates two water, and all the tar and ammonia pumps. The two water pumps mentioned are in the cellar of this engine room, drawing their supply from a near by well, which is 137.79 feet in depth, and forcing the water to the reservoir, which is on the third floor of the water tower. The tar and ammonia pumps are not in this engine house, but are in a separate room alongside. In the same engine room are two hydraulic pressure steam pumps, one of which serves always, like one of the engines, as a reserve pump. These pumps are each 25 horse power, and draw their supply from a cistern under the power station, forcing the water into the water pressure accumulator, the piston of which is weighted with 187,392 pounds of cast iron plates, and by means of which a hydraulic pressure of 735 pounds per square inch is maintained. Accumulator, pumps and cistern are connected in such a way that no water is wasted; that, in case of need of power, the pumps are started automatically, and if the accumulator should happen to be exhausted, the pumps work on the water pipes direct.

There are two systems of water pipes, viz.: Those for power purposes only, and others, under normal pressure, for general use. The ammoniacal liquor is worked up for sulphate, and the separate building provided for that industry contains also suitable drying and storage chambers. In the yard, near the coke store, is located coke-breaking, screening, sorting and loading apparatus of 22,046 pounds capacity per hour. The building devoted to workshops is located opposite the retort house, and contains, on the first floor, a machine and blacksmith shop; on the second, meter shop and proving rooms for gas and water meters; on the third, storage rooms. Attached to this building is a fireclay mill, which is operated by the 4-horse power gas engine, which also furnishes power for the machine shop adjoining.

The commodious office building, opposite the main entrance to the works, contains, in the basement, a laboratory, living rooms for the janitor, and cellar storage rooms for the resident officials. On the first floor are the executive offices of the Managers of both the city gas and water works; while the second floor is taken up as living rooms for the Superintendent of manufacture of gas and the Superintendent of the water works. These works have been in daily operation since 1896, and have given entire satisfaction in every particular; realizing the hopes and expectations which the city government was entitled to entertain concerning the same.

The cost of manufacture during the year 1897–98 was 20.64 cents per 1,000; and, including interest and sinking fund, 48.50 cents per 1,000 cubic feet.

The compiler of the preceding description need perhaps not point out the salient features contained therein; but the final figures are worth considering in connection with the ill judged, ill advised "gas war" which has for some time prevailed in the American Metropolis. Well-informed people know that labor and material are cheaper in Germany, in fact everywhere in Europe, than in this country; and the professional ability of the engineers and managers is beyond doubt equal to

the average in our own country. Consequently what must strike the thinking reader most, is, how can 50 cent gas result in a profitable investment, or to the ultimate advantage of anybody in New York City, and some other places, as well. If the Companies obtained their gas *for nothing*, there would not seem to be much margin of profit at the present ruling prices. The writer would emphasize, for the benefit of those who may question the matter, that he is pretty closely informed as to the actual cost at which gas can be made *and sold for* in the locality named.

The practical man will perhaps figure over the manufacturing results which can be picked out from this description, and the members of the American Association's Educational Classes, will find matter worthy of their efforts in it. For instance: If, as was shown in the JOURNAL, on another occasion, "English" coal in Germany yields on an average 4.64 cubic feet of gas; then, if 5.55 per cent. retorts are scurfing, we will get a charge of 466 30 pounds of coal in four hour charges, if the works are operated up to their full capacity, and 12,981.79 cubic feet of gas per retort in 24 hours. And we can pick out that, though the coke handling machinery seems to be small, yet that it can do the work required in less than 10 hours. But let the "studious" student try for himself, *if* "*inclined.*"

[From *Engineering*.—Continued from page 694.]

American Competition.—No. V.

By MR. JOHN THOMPSON, Engineer, New York.

"America-Britannia; one root, two branches; one language, two flags."

Why American industries are able to compete successfully with those of Great Britain can be assertively answered in a paragraph: It is because of better organization; more complete adaptability of system; great incentive; a higher or broader development of engineering as a profession; ready flexibility to meet new conditions, and because low-priced craftsmen in Great Britain may, and do, more quickly become high-priced master workmen, or foremen, or superintendents and proprietors, when transferred to America. But assertions are not reasons. It is the examination of those causes which, in the opinion of the writer, permit this condition to exist, which must constitute an answer to the query propounded.

First, let it be said that the writer it a Scotchman by parentage and birth, and he is proud of it; he is also an American citizen, and he is almost equally proud of that. Therefore will he on the one hand earnestly endeavor to follow the Carlylean admonition, "Strive to keep a free open sense, cleared from the mists of prejudice;" and, on the other hand, will he abjure vain boastings.

Low-priced labor is not necessarily, nor is it, as a rule, the least expensive. The lower the price paid for a defined term of service, the less is the incentive to produce greater results within that term. This is inborn; it is human nature; the principle is correct; it will outlive trades unions and harsh masters. The more effective the machine, or process, or plant, the better should be the man who responsibly controls or operates it; and the greater should be his recompense. And the corollary to this is: The better the man, the more accurate and the keener his intelligence, the better will be the thing which he will fashion every time.

British, Swedish, German, French and Swiss mechanics, that is to say, skilled hand workers, dexterous through long, careful apprenticed training in the use of hand, and of machine, tools, have been largely the foundation and the mainstay of the success of American manufacturers. To a considerable extent they occupy that position to-day. You teach the kindergarten principles; we complete or develop that training and quite properly derive the benefit. Do you begrudge such a result when derived from such a cause?

Environment, in its broadest aspect, should be given, it is believed, the first place among the reasons for American constructive success. It is quite possible that an engraver or a watchmaker could ply his handicraft in the depths of a coal pit lighted by a tallow dip; but it is beyond dispute that the quantity of his work, and the degree of its excellence, would be much greater were the operations performed at the surface in the full volume and steadiness of the north light. Would auld Scotia have had that proud distinction "never conquered" had the national tipple been less inspiring than *usqueba*? Think of fording Highland burns, or trudging miles in moorland mists, on a diet of dough and beer! These simple illustrations must suffice as well for the intellectual and the moral, as for the physical.

Closely allied to this phase of the matter is freedom of exercise of ambition upon the part of the operator, and measurably proportionate pay for the results obtained. This covers the great principle of incentive, and applies both to the operator and to the proprietor. Americans can in no wise claim to have reached an ideal position in this respect; but it is maintained that this principle has been carried further in America, and has produced better effects, than the system in vogue in Great Britain and elsewhere; the consequence of which is to produce an average result equal to that of the least efficient member.

The position, as a manufacturing nation, of Great Britain is that derived from dear-bought and long time developed experience. May it not be accepted as an axiom that that which is obtained slowly and by arduous effort will be the longer cherished and retained? Experience is the most valuable asset of civilization. It is also too frequently the greatest bar to progress. Pig-headedness, obtuseness and stupidity are often excused on the plea of "experience." It is mainly from too firmly anchored opinions which have sprung "that conservatism which fights all innovations, simply because they contravene present ideas and practices, and against which advancement must ever contend." On the other hand, the relatively high place occupied by the United States, in all except the heaviest classes of machinery, forgings, etc., has resulted, to a considerable degree, from successful experimentation; the consequence being a greater and better output in less time, or with less labor, than is possible by old methods. It is confidently asserted, as a fact of common knowledge, that the necessity, or the desire, or the spirit, which conceived the vision of an improvement in process or method, and then promptly carries it through to a successful practical demonstration, is the most likely to be eager and ready to improve upon the improvement if the opportunity is presented. "Every undertaking, properly executed (should) bring about improvements in the process of execution.'

There is no doubt that the interchangeable, or, more properly, the duplicate system of construction of the component parts of machinery and structural steel members, has been carried to a higher stage of development with us than elsewhere. The contingent advantages arising from this development could hardly have been foreseen by the early promoters of the system. It undoubtedly has had much to do in generalising the practice of paying for construction by the piece, or to base the *per diem* wage upon the number of parts or operations produced in a given time with given facilities. It is only by the proper carrying out of this method that the ability of the operator can be ascertained and obtained; it is only by this method, too, that the operator can obtain increased wages for the higher cultivation of his skill. Moreover, it is only by this method that the full capacity of the improved machine, or special tools, or fixtures, can be derived. Thus, the engineer who designs a tool whose output of a certain kind is increased over previous practice, is entitled to that increase. Again, the operator who by diligence and the exercise of his ambition obtains the greater output from that tool is entitled to the larger remuneration. A really successful duplicate system of construction involves intelligent co operation. The consequence of this co action with us, and there has been much of it, has been a higher average of wages to the workman, and a greater, or a better (and hence more salable or more profitable), output for the proprietor. This would seem to come fairly close to the "business end" of the matter.

This inquiry can also be well answered from another view point, one which because both complimentary and truthful, may be the more gracefully received. The condition indicated has been largely produced, or made possible, from those splendid British characteristics, tenacity of purpose, perseverance, stubbornness, patience, loyalty, respect for usage, and maintained performance of duty according to the conscience or under orders.

These attributes, when applied to new fields of progress, mean slowness of change from existing methods; more or less of defiant, crusty opposition to modification; satisfaction with that which has been accomplished in the past, and stolid confidence, or indifference, as to the results of the future. Great may be the impetus due to environment; much greater may be the restraint of precedent! And just how this may operate in practical life may best be illustrated by the presentation of an imaginary case. Thus, assume two engineers, British born and bred, each the equal of the other in technical training and general commercial ability. Place one in charge of an old-established manufacturing plant, venerably situated, every machine with a legendary history; the operators, descendants of operators, skillful as, and only as, their forbears were skillful.

On all sides, within as without, the same adolescent conditions prevail. Why apply a ruthless hand here? Why not maintain "the even tenor of his way?" The time-honored plant will remain and, mayhap, the business may continue. Now imagine our other engineer

with an exactly similar plant and business, but that all are transposed intact to, say, the heart of our New England with its all-pervading atmosphere of energy, invention, system and exactness. How long can he there continue commercially? Theoretically, not one day; practically, until his capital is paid out. The time-honored plant would remain, but the business must of a certainty vanish or change hands. But imagine that, becoming quickly imbued with the spirit of progress (the necessity, here, of existence) he casts the archaic tools aside and razes to earth the roof and walls, time-honored though they be. Verily, the shadow of antiquity will have departed; but the seed and essence hath been retained! And in the goodness of time engineer number two may, with some justifiable elation, supply engineer number one with the results of modern enterprise. The lion may slowly raise his shaggy head and growl a bit, but, well, 'tis his nature too."

The foregoing phantasy may be objected to as indicative of irreverence. Undoubtedly that is true. But while it has chiefly been employed to point the moral of a condition rather than a theory, it also leads directly to a well-defined characteristic and practice peculiar to American constructors, namely, the knowledge of when, and the courage, to promptly discard outfits of special tools, even when originally very expensive and yet measurably efficient in performance, when a still better and more productive design is suggested for substitution. This is where American civil and mechanical engineers have scored their greatest successes, the outgrowth, it may be said, of cultivated dissatisfaction with anything susceptible of improvement. Such actions frequently involve sweeping changes and complete rearrangement of machinery and *personnel*, and an upheaval of this kind is the most severe test of the duplicate system. Right here may be quoted some observations recently expressed to the writer by one of the most expert and successful mechanical engineers and superintendents in New England: "The chief trouble with foreign mechanics is that they know only one branch of the business, which is due to the laws of their trade unions, which in many cases prohibit the working or running of more than one machine; hence they learn only one branch of the business. This destroys the ambition of the workman, and limits his production and his value. This is especially the case with the English trade union mechanic. * * * For filers and fitters, or vice men only, Germans are the best men for this class of work we can get. Their early training at handwork makes them experts in this line. * * * The Swiss are fine workmen, and they take advantage of machines very readily. * * * The Scotch and English workmen are also hand workers, and they are our blacksmith or anvil forgers. They are the only fine smiths in America to-day; as this business has no attraction for the native boy, who usually prefers to take a clerkship at about one half of the remuneration."

There is still another feature which, it is believed, is peculiarly American in the degree of its development and the extent of its application, that is our system of detail-accounting to determine the cost of each operation. This, too, may be regarded as one of the contingent advantages growing out of the duplicate system, as it is quite certain that the highest value of that method cannot be obtained except as the result of the closest detail-accounting of each and every operation. It is chiefly by means of this knowledge that future improvements of process, and reductions in cost or increase of product, can be intelligently reached and maintained.

It is believed that our duplicate system and payment therefor by the piece, has resulted in the development of a more perfect method of inspection than that of our national competitors. In fact, where there is much subdivision of operations on single parts, each operator becomes an inspector who, from self-interest, cannot afford to accept imperfect work. Consequently, the assemblage, or the inspection, is the more quickly performed, and the final, or averaged, results are often greater than would be predicted upon the scrutiny of separate details; thus, in fact, producing an extra increment, flowing from the necessary coaction of the several performers.

Silk hats and frock coats have had a beneficial effect upon American manufacturers. This benefit has been derived from the fact that the wearing of these symbols of gentlemen merchants, during the active hours of business, is peculiar to our esteemed British contemporaries. Such a uniform is not conducive to factory inspection on the part of principals. On the other hand, if discarded, does he not, like a Chinaman without his pigtail, lose caste? Great is the power of (British) usage!

Drowsy ale and stinking pipes have been beneficial to American manufacturers in that one of the traditional heritages, a "right," of the British mechanic, they, to a considerable degree, and as a matter of stubborn course, have maintained and monopolized the practice. As to these, even pie, ice water and cigarettes are to be preferred. Yet "Britons never, never shall be slaves!"

"Working by the clock," as in your practice, has helped the differentiation of results to our favor. This, doubtless, brings more recreation, and possibly longer life; but that phase of the subject is not to be considered here. Work till you finish; look only at the clock thenafter, say we.

We, undeniably, are the more prompt in recognizing and adopting improvements. Where you oppose and thrust off, we receive and utilize.

A suggestion, or a request, to modify the construction of a machine is too often taken by you as if implying a defect in the original design or impunging the ability of the designer. With us the common attitude is that the desired modification may denote an improvement to be accepted for permanent adoption.

While the foregoing is believed to fairly answer the inquiry submitted, does it not at the same time denote the route you should traverse if you admit that improvement in your practice is desirable? If this should prove to be the case, then would the result be doubly attained; for "with all thy faults we love you still." And with good reason. Have we not fresh in memory the "Venezuelan incident," when the restraint of simple dignity, the force of self contained character, put sober sense against bluster, and showed the folly of it? Then at Manila you were as proud of your one-time colonists as if they had been your colonists still. It was like praise from Sir Hubert himself. It was honest. It was admirable. It was appreciated. Moreover, now that we, too, have become expansionists, our hands working with yours for the open door (which the foster parents of our protectorate for "infant industries" now find convenient for the ejection of their sophistries); may we not look forward to a nearby time when each shall more heartily cooperate with the other to the betterment of the earth? Why? Because such coaction would mean peace on earth, or a thrashing for the earth; as the earth in its discretion may elect.

If the "duplicate" system shall ever accomplish this then the acme of its usefulness will have been reached.

[Continued from page 614.—From the *Sanitary Plumber*.]

Pointers on Practical Gasfitting.—No. II.

Some people prefer drop fixtures for toilet lights in the place of wall brackets. Drops for toilet fixtures should be about 15 inches from the wall. There are bracket toilet chandeliers made, for which the opening must be placed in the side wall instead of the ceiling. Both are open to objection, however, as they are in the way of moving the dresser in or out of place.

Never run a newel post supply until the stairs are finished, as the post seldom comes just where it is shown on the plan.

Never get out pipe for one floor by the plan or diagram of another, no matter if the arrangement of the rooms is supposed to be the same.

In putting in gas pipe, care should always be observed to have no traps in the pipe and to have the pipe drip either to the fixtures or source of supply, whether it be meter or gasometer. When it is possible to drip the pipe to the supply, be careful not to take branches out of the trunk line on the bottom, as condensation would fall into them instead of going back to the riser. This fact accounts for certain fixtures in many jobs always giving trouble, while the others behave nicely.

In order to give the pipe a continuous fall in all cases, either to the fixture or source of supply, it is sometimes necessary to cut the joists through which the pipe is laid much deeper than the external diameter of the pipe. So it is best to route the pipe as close to partition walls as possible in order to prevent weakening the joists by cutting. There is not so much necessity for giving the pipe a fall when coal or water gas is to be used as there is for vapor gas work. Where gas is manufactured in large quantities the makers are prepared to take out all the tar and heavy hydrocarbons that are likely to condense, and the gas travels through long lines of pipe before reaching the consumer, giving the cool earth through which the pipes pass a chance to further extract any condensable constituent, so that by the time the gas enters the individual pipe system of the house it is practically a fixed gas. The gasoline gas made in the usual way is merely the atoms of atmospheric air varnished over with a good grade of gasoline, with which it will part under variable temperatures; hence the great care necessary in putting in the pipes for it, in order to avoid trouble from condensation.

Whatever kind of gas piping may be installed for, except for natural gas, it is advisable to run as much of it as possible on the interior walls and keep the under floor pipes as remote from the exposed walls as circumstances will permit. The interior walls and central portions of the floors are of the most equable temperature and less likely to cause trouble by condensation of the gas.

Natural gas, as a rule, is almost free from moisture, and will not condense. Therefore, it can be piped in shallow trenches, run up the walls on the outside, or placed where exposed to the action of the

winter temperatures, with impunity. Many natural gas wells furnish gas that is odorless. On account of the high pressure at which natural gas is delivered, together with its being odorless, it is necessary to be very careful in laying in the pipes to convey it.

In factories or stores where the buildings get cool over Sunday in winter weather, having the piping done in such a way that there are but short branches from the trunk lines to the burners is a good feature, as it tends to prevent condensation, especially if the gas is other than well fixed.

Buildings using poorly fixed gas, and subject to variable temperatures, should have the piping arranged so as to be able to circulate the gas by burning a jet under the pipe in the basement.

This not only prevents freezing and annoyance from condensation, but also improves the light if the gas is burned while warm.

Gas companies will object to a jet being placed under the pipe outside the meter connection for any purpose, as the hot gas would dry out the diaphragms of the meter if any should be burned while the pipe was so warmed.

It is obvious that no circulating arrangement can be used unless it be entirely on the house side of the meter, as otherwise the gas would not be measured.

In circulating systems it is well to have a by-pass and cock at each governor, and to shut off the governor on each floor before lighting the circulating jet. If this is not done, the expansion of the gas will very likely blow the seal out of the governors.

In factories and printing offices the trunk lines should be made as large again as is absolutely necessary, in order to be able to add additional lights after they are in operation. Because, invariably, a greater number of lights are needed than is at first estimated.

In all large buildings it is advisable to have a stopcock on the riser or main to each floor; then, if anything happens, such as a fixture getting broken off, or there is some alteration or extension of the pipe necessary, one floor can be shut off without affecting the light on the others.

As a rule, the following sizes and lengths of pipe are acceptable in practice to gas companies for lighting with coal or water gas:

Nominal Size of Pipes.	Feet Allowed.	No. Burners.
¼-inch	6	1
⅜-inch	20	6
½-inch	30	12
¾-inch	50	20
1 -inch	70	35
1¼-inch	100	60
1½-inch	150	100
2 -inch	200	200

For vapor gas, increase the sizes given for coal and water gas at least 25 per cent., because vapor gas is of greater sp. gr. than the others and a smaller amount of it will issue through a certain size orifice under a certain pressure in a given time. Vapor gas condenses, too, and deposits a gummy substance which clogs the pipes more or less.

No set of rules for proportioning the lengths and sizes of gas pipe will answer in all cases. The fitter must use his good judgment about the matter. For instance, suppose we fit a building with gas that gives the opportunity to use the maximum length of pipe allowed of each size; say 200 feet to the first branch and there take off for 50 lights (1¼ inches), then continue for 150 feet with 1¼ inches and again take off for 50 lights. At that point three-fourths of the area of the 2-inch pipes would be required for the two branches; the maximum length of 1¼ inches would already have been installed, and yet there would be 100 lights to supply through a trunk line of 276 feet, without considering the extremes to which the matter might be carried by diminishing the branches accordingly. Taking the rules literally, all this would be proper and the company could not dispute that the rules had been observed, although we know the lighting of a building under such conditions would be a failure.

Except in the case of bracket lights we cannot tell whether one jet or twelve will have to be furnished with gas by the opening we leave for a fixture; therefore, it is best to run no pipe horizontally of less than ¾ inch diameter, and for parlors and other rooms likely to want a great number of lights, put in ½-inch drops.

In fitting pipe for coal and water gas it is always understood that bracket pipes are made of ½-inch pipe. For that reason it is unnecessary to designate the size of them upon working diagrams.

For vapor gas, never make a bracket pipe of less than ¾-inch, unless on the lower floor of a building several stories in height, and never, on any occasion, put ½-inch pipe under floors.

Coal gas, and other gases of less specific gravity than atmospheric air, but of about the same gravity as coal gas, increases about one-tenth of an inch water pressure for every 10 feet the pipe is extended vertically. Consequently, everything considered, there is always the best pressure on the top floor.

In vapor pipe work the bracket pipes should always be run downward from the upper floors instead of upward from the lower floor, as is usually done on coal gas work. In that way the gravity of the gas in the bracket pipes is made to maintain the pressure, and the extra head of pressure otherwise necessary to overcome the friction encountered in the bracket pipes is unnecessary.

In towns that have greatly varying street levels there are often two systems of street mains, one for the high level and the other for the low district. By means of governors and feeder mains such towns have about equal pressure at all points. It is well to ascertain what provision is made by the gas company for varying pressure before making any compensation for high levels in the piping of the house.

If the building to be fitted is very high as compared with the altitude of the gasometer supplying the gas, and the building is one in which the care of a governor would not be desirable, the excessive pressure may be counteracted by running a smaller pipe than usual. An experienced man should determine the sizes to be used in such cases, however. On the other hand, if the building is low as compared with the source of supply, the pipes should be full size, even larger than is called for.

In changing from the use of coal or water gas to vapor gas, it is well to run a feeder riser up as high as the attic and return, connecting with the old system at two or three points. The gas will in this way spread through the pipes and give a good supply with only the head of pressure due to the gravity of the gas, while if the old riser introduced the gas, perhaps double the pressure would be necessary to overcome the friction in the small pipe. When a main is connected in this way let the old riser serve as a drip to the system.

In factories or business buildings where a great number of lights are used, it is best to place a governor on the main branch for each floor. Then, regardless of what the pressure would be without the governors, the gas can be burned at all points at about 5-10-inch water pressure, which is the most economical pressure it can be consumed under.

In store buildings or factories where nearly all the lights are in rows, it pays to locate the trunk lines near the lines of lights, as it saves running over to the center from the side, or from center to side, as the case may be.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

Even in Belfast, Me., the increasing impetus of the gas business is felt, for the proprietors of the Belfast Light and Power Company are making something out of their hitherto neglected gas division.

"X," writing to the Journal, in a letter dated New York, the 30th October, says:

To the Editors American Gas Light Journal: From your "item" in the last issue of the Journal, it is evident that the Directors of the Lowell (Mass.) Gas Light Company do not know a good thing when they have it. The proposition of the "responsible bankers" to pay $2,000,000 for the property which the Lowell Company's Directors direct would net the proposers at least $40,000 per annum, since the Company's net profit is about $140,000 per annum. Consequently the takers over would have no difficulty in hypothecating the stock in perpetuity to secure a loan of $2,000,000 at 5 per cent., even if the laws of Massachusetts applicable prevent their raising the money in any other way. The net profits of the Company, for the year ended June 30, 1898, were $125,116, and since then the profits have increased fully one-eighth; or say, to the point where over $140,000 was the sum earned. The Company pays 22 per cent. dividend on its capital stock, while its statement seems to warrant the assertion that it is actually earning about 28 per cent. After the shareholders have parted with their stock at 400, upon which basis they are now receiving, in dividends alone, 5½ per cent., they will be hard set to find a better security for their money than to reinvest it in the $2,000,000 loan, at 5 per cent., if they are fortunate enough to be permitted so to do. Those who reinvest in this way will no doubt do so on the theory that a part is greater (and better) than the whole.

Our correspondent's lines suggest the thought that the unearned increment is much, which thought leads to the belief that the earned increment is the more.

Another correspondent (Mr. Frederic Egner), writing from Norfolk, Va., under date of October 30, says:

To the Editors American Gas Light Journal: It gives me more pleasure than I can express at this time in words, to see in your columns of even date, that the Kings County Gas and Illuminating Company has authorized the firm of Bartlett, Hayward & Company to construct for it a complete, new, modern gas plant, and that the feature of the generating apparatus is that it is to consist of five benches of 9's on the inclined plan. That the design thereof is to be from the plans of Mr. Fred. Mayer is only a feature which confers additional satisfaction to one who has so long advocated this step as a great advance in the economical manufacture of gas, for Mr. Mayer will no doubt show us that he has learned something from the partially successful attempts of those who were first in the field. Permit me to add to the information that you have given in your columns on this subject that, before build-

ing, the permission of the owner of the American patents respecting such construction in this country was first obtained. Again, it should not be forgotten that it was Mr. A. H. Barret, the Engineer of the Louisville (Ky.) Gas Company, who was the first American gas engineer that had the requisite courage to take up in a practical way an improvement which, saving about one-half the labor, manufacturing expense of making coal gas, is almost a chestnut with English and German gas engineers.

MR. GEORGE E. FENETY, for many years prominent in the management of the Frederickton (N. B.) Gas Company (he had been its President for several terms), died on the afternoon of October 12th. Deceased was born in Halifax, Nova Scotia, January 12th, 1812.

MESSRS. S. Thirwell, Jas. S. Shaffer, Robert Muir, L. S. Walter and J. P. Helfenstein will apply, on the 13th inst., to the Governor of Pennsylvania for the right to operate a gas works in Mount Carmel, Pa. The title of the concern is to be that of the Mount Carmel Gas Light Company.

MR. OSCAR B. WEBER, writing on behalf of the Adam Weber Company, 633 East 15th street, N. Y., says that the Company has been awarded the contract for all the firebrick material necessary for the construction of the new coke oven plant to be constructed by the United Gas and Coke Company, Sydney, Cape Breton. The weight of the material embraced in this contract amounts to something over 20,000 tons. The Weber Company also has been awarded the contract for the construction of the drying ovens and boilers for the Great Northern Paper Company, the new plants of which (at Millinockett, Me.) Mr. Oscar B. Weber assures us will be the largest paper mill in the world. Still another contract for the Weber Company is an agreement that it shall furnish settings for a 20,000-horse power boiler plant for the Edison Illuminating Company, Brooklyn, N. Y.

THE San Francisco (Cal.) Coke and Gas Company has been incorporated by Messrs. T. S. C. Lowe and L. P. Lowe, of Passadena, and Messrs. Adolph Feist, Duncan Hayne and Leopold Michels, of San Francisco. The capital stock, as to its ultimate, is $5,000,000, of which $500 has been subscribed. The balance may come along in due time.

A CORRESPONDENT incloses the following, under date of October 28: Yesterday Mayor Chase, of Haverhill, Mass., forwarded the inclosed letter to the Board of Gas and Electric Light Commissioners, the terms of which would indicate that Mayor Chase is a bit on the rainbow order:

CITY OF HAVERHILL, EXECUTIVE DEPT., October 25, 1899.

To the Board of Gas and Electric Light Commissioners, Boston—Gentlemen: The undersigned, Mayor of the City of Haverhill, represents that the Haverhill Gas Securities Company, formerly the Haverhill Gas Light Company, is at the present time charging $1.10 per 1,000 feet for gas in the City of Haverhill. As this Company is capitalized at only $75,000, and has, according to the Commissioners' report of 1898, declared dividends for the year 1898, to the amount of $37,500, besides dividing a surplus fund of $260,000, I believe this price is exorbitant, and believing that a public hearing will disclose the facts as to whether this price is excessive or not, and will do justice to all, I, therefore, according to the provisions of Chapter 314, of the Acts of 1885, respectfully petition your Board for the hearing upon this matter at the earliest possible time, and that your Board take such action in ordering a reduction as the circumstances may warrant. Yours respectfully, JOHN C. CHASE, Mayor.

Mr. W. F. WISE, writing under date of the 29th October, incloses the following clipping from the Nashville (Tenn.) *American*, dated October 28: Mr. Thomas F. Kendrick, one of Nashville's best known citizens, and Secretary of the Nashville Gas Light Company, died at his home, 116 North Spruce street, about 7:30 o'clock yesterday morning. Several weeks ago Mr. Kendrick suffered a stroke of paralysis, and this is assigned as the direct cause of his death. The deceased was a native of Davidson County, Tenn., and was reared in Nashville. When a small boy he accepted a place with the Nashville Gas Light Company, and by strict attention to his duties, won for himself the confidence and esteem of his employers. He climbed the ladder, round by round, until he reached the profitable and honorable position that he held at his death. He was in his 58th year." Mr. Wise adds to this mention: "The funeral was held the afternoon of October 28th, the services being conducted by the Rev. W. T. Manning. The pallbearers were Major A. W. Willis and Dr. W. A. Atchison and Messrs. Leslie Warner, G. W. Fall, J. S. Reeves, Nat. Baxter, W. L. Nichol, L. R. Eastman and Jas. C. Bradford and Dr. Richard Cheatham. Mr. Kendrick is survived by two daughters, Mrs. John H. Reeves and Miss Minnie Kendrick. Deceased was held in high esteem by the community, wherein about all of his useful business life was passed."

THE Saratoga Traction Company, of Saratoga Springs, N. Y., has placed the order for its new viaduct with the Berlin Iron Bridge Company, of East Berlin, Conn.

LATE last month the Directors of the Bethlehem South (Pa.) Gas and Water Company decided to reduce the Company's capitalization from $350,000 to $175,000, the par of the shares to be reduced from $50 to $25. The distribution meant really the division of $175,000 among the shareholders. The settlement was made preparatory to the taking over of the Bethlehem plant by the Wyandotte Gas Company. Mr. J. Davis Brodhead was elected a member of the Board of Directors, vice Mr. Robert H. Sayre, resigned.

MR. L. A. LYDIARD, City Clerk of Minneapolis, Minn., as the result of the proposals submitted to the authorities of that place, under the terms of the advertisement for bids for public lighting, made public October 20, and to close the 27th of the same month, seems to be in a quandary. To go behind the Clerk, it looks that some of his superiors are in the position of having to choose between love and duty.

MR. CHARLES H. PORTER, a faithful employee of the Providence (R. I.) Gas Company, since 1871, died at his home in that city the evening of October 26th. The Providence *Journal*, in noting Mr. Porter's death, had this to say of his career with the Providence Gas Company: "Born in Pawtucket in 1828, deceased came to Providence when in his fifth year, and here has resided ever since. He learned the machinists' trade, at the Providence Steam Engine Company's works, and was employed by that concern for 19 years. He transferred his labors to the Rhode Island Locomotive Works, remaining with that Company until 1871, when he was employed by the Providence Gas Company, with which corporation he served, as Superintendent of its meter department, until the time of his death."

THE authorities of South Bend, Ind., have agreed to the extension of the franchise of the South Bend Fuel and Gas Company for a period of 50 years. Under the agreement between the authorities and the Company the latter will institute a graded selling schedule which will give dollar gas to the South Benders in 1903.

JUDGE MALONE and his associates in control of the properties of the Nashville (Tenn.) Gas Light Company have arranged a sensible plan for the succession of its rights to a Company to be known as the Nashville Gas Company. This action is a simple, formal way of enabling the shareholders in the former named Company, the charter rights of which expire by limitation the 21st inst., to continue their trading as an intact, corporate body for an indefinite time. The Judge seems to be a pretty thorough sort of business man, quite unlike those who thought they knew all about gas trading, say a year or two ago—in the Van Kirkman days for instance.

THE Nazareth (Pa.) Illuminating Gas Company has been chartered by Messrs. Conrad Miller, M. T. Swartz, J. A. Miller, L. C, Williams and J. J. Heintzlman. This place is a borough of Northampton county, Pa., and is about 7 miles northwest of Easton. Founded in 1741, by a pioneer American Moravian named George Whitefield, in 1899 its population does not exceed 2,200, although its wealth is much. Likely the incorporation or chartering is the first step to induce the Easton Company to extend its pipes to Nazareth. There are, however, some difficulties of a nature natural that would seem to militate against such piping. In other words, a pipe line to Nazareth from Easton would, from the topography of the country, be quite an expensive construction.

Mr. I. E. MARSHALL, who has been trying to keep the Martinez (Cal.) Gas Company on its feet for some years, has decided to shut down the plant. The likely outcome is that the plant will be operated by the local electric lighting interests.

IT is reported that a plan for the consolidation of the local electric railway and the gas and electric lighting interests of Rome, Ga., has been agreed to. Mr. Seymour Cunningham, of Litchfield, Conn., is the active agent in the consolidation proceedings.

THE proprietors of the Paterson and Passaic (N.J.) Gas and Electric Company have agreed to make the following schedule of selling rates for the time, and under the scale named in the appended statement: For 1 year from November 1, 1899, $1.25 per 1,000 cubic feet; for 1 year from November 1, 1900, $1.15 per 1,000; for 1 year from November 1, 1901, $1.10 per 1,000; for 1 year from November 1, 1902, $1.05 per 1,000; after November 1, 1903, $1 per 1,000.

THE Standard Gas Company, to carry on business in Danville, Pa., has been incorporated by Messrs. W. D. Boyer, Grant Pelton, Jno. B. Russell, G. W. Reynolds and E. F. McCabe, with a capital of $75,000. The same parties are named as the charterers of

the Standard Electric Light Company for the same place. The dual concerns may be accepted as vehicles for the merging of the existing gas and electric lighting interests of Danville.

MR. JOSEPH STOCKMAR, who is the Deputy State Inspector of Gas Meters for the Buffalo (N. Y.) district, formerly kept a saloon or liquor store at the corner of Hickory and William streets. In an interview recently brought off between the deputy and a reporter of the Buffalo *Courier*, replying to the question as to whether or not the former charged a fee for a meter tested on complaint of a private party, the answer was: "I do not know whether I am entitled to so charge or not. I have not so far. The present Chief Inspector, Mr. Jastrow Alexander, is Governor Roosevelt's personal appointee, and is making radical changes in the department. We are required to submit monthly reports of work done, and as he objects to any other business being carried on in conjunction with the inspectorship, I have given up my saloon at Hickory and William, partly on that account, and partly because it did not pay." Mr. Stockmar is nothing, if not frank; meanwhile the gas people are paying the bills for inspection.

A CONCERN known as the Fidelity Gas Company is said to have purchased a controlling interest in the Hoosick Falls (N. Y.) Gas Light Company. Messrs. Danforth Geer, W. A Wood, Jr., and J. A. Beckett no longer have any connection with the enterprise. The new Company is managed by these officers: President, E. R. Care; Vice-President, Willis E. Heaton; Treasurer and General Manager, C. E. Fennessy; Secretary, C. E. Cheney.

MR. W. E. HAMILTON, Manager of the Shreveport (La.) Gas, Electric Light and Power Company, is satisfied that the improvements on the gas division of the Company's properties, which improvements were made under his direct supervision, will enable him to give to Shreveport all the gas that its residents may demand for the near future; and their demand in that line is increasing all the time.

The Market for Gas Securities.

Lack of animation continues in the market for city gas shares, but strength is the prominent underlying feature. Yesterday (Thursday) a good share of trading was done in Consolidated, the high price being 192¾. There was very little market for it to-day and the closing came in at 191½ bid, offered at 192¾. There was some inquiry for Mutual during the week. Amsterdams show no change, and Standards are steady and strong. In these dark days the "giant financiers" are losing quite a bit of money.

Brooklyn Union is 145 bid. It is worth 200 in case the rate war in Manhattan is settled before the Legislature meets. Peoples of Chicago is strong, as it should be on intrinsic worth. The real sensation of the market was an advance in Bay State to 2¾. Washington gas is 285 bid.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

Nov. 6.

☞ All communications will receive particular attention
☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$39,078,000	100	191½	192¾
Central Union, Bonds, 5's.	3,000,000	1,000	107½	108½
Equitable Bonds, 6's	1,000,000	1,000	105	.
" 1st Con. 5's	2,300,000	1,000	115	18
Metropolitan Bonds	658,000	.	108	112
Mutual	8,500,000	100	290	300
" Bonds	1,500,000	1,000	100	102
Municipal Bonds	750,000	.	..	
New Amsterdam Gas Co.	13,000,000	100	29½	30¼
Preferred	10,000,000	100	54½	56½
Bonds, 5's	11,000,000	1,000	96⅞	97
Northern Union, Bonds, 5's.	1,250,000	1,000	95	97
New York and East River..				
Bonds 1st 5's	3,500,000	1,000	109	111
" 1st Con. 5's	1,500,000	..	112	114
Richmond Co., S. I.	348,650	50	70	..
" Bonds	100,000	1,000	..	..
Standard	5,000,000	100	110	120
Preferred	5,000,000	100	140	150
Bonds, 1st Mortgage, 5's	1,500,000	1,000	112	114
Yonkers	299,65	500	130	.
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	145	..
" " Bonds (5's)	15 000,000	1,000	118	119
Bay State	50,000,000	50	2⅛	2¼
" Income Bonds	2,000,000	1,000	..	75
Binghamton Gas Works	450,000	100	40	..
" 1st Mtg. 5's	450,000	1,000	95	98
Boston United Gas Co.—				
1s Series S. F. Trust	7,000,000	1,000	92	..
2d " " "	3,000,000	1,000	68	71
Buffalo City Gas Co.	5,500,000	100	9	11
" " Bonds, 5's	5,250,000	1,000	84	85
Central, San Francisco	2,000,000	..	105	..
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	104¼
Columbus	1,144,700	100	70	75
1st Mortgage	1,207,000	1,000	106	108
Consumers. Jersey City	2,000,000	100	100	..
" Bonds	600,000	1,000	107½	110
Cincinnati G. & C. Co.	8,500,000	100	193	194
Consumers, Toronto	1,700,000	50	230	235
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Consolidated, Baltimore	11,000,000	100	62	63
Mortgage, 6's	3,600,000	..	..	118
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	112
Consolidated Gas Co. of N.J.	1,000,000	100	21	23
" Con. Mtg. 5's	880,000	1,000	87	90
Consolidated G. & E. Co.'s., Little Falls, N.Y.	90,000	100	..	100
Bonds	75,000	..	..	100
Detroit City Gas Co.	4,560,000	50	100	101
" Prior Lien 5's	4,546,000	1,000	94¼	94½
Detroit Gas Co., 5's	423,000	1,000	100	101
" Inc. 5's	31,000	100	100½	101
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Fort Wayne	2,000,000	..	77	83
" Bonds	2,000,000	..	80	85
Grand Rapids Gas Lt. Co..	1,000,000	50	..	..
" 1st Mtg. 5's	1,125,000	1,000	..	..
Hartford	750,000	25	..	220
Indianapolis	2,000,000	..	122	128
" Bonds, 6's	2 650,000	..	105	106
Jackson Gas Co	250,000	50	50	..
" 1st Mtg. 5's	250,000	1,000	96	100
Jersey City	750,000	20	225	275
Lafayette Gas Co., Ind.	1,000,000	100	68	70
Bonds	1,000,000	1,000	81	86
Louisville	2,570,000	50	106	108
Laclede, St. Louis	7,500,000	100	77½	77¾
Preferred	2,500,000	100	102	103
Bonds	10,000,000	1,000	107	108
Madison Gas & Elec. Co.	400,000	100	82	85
" 1st Mtg. 6's	350,000	1,000	102	..
Montreal, Canada	2,000,000	100	200	..
Newark, N. J., Gas Co	16,000,000	..	50	60
Bonds, 6's	4,600,000	..	107	108
New Haven	1,000,000	25	280	300
Nashville Gas Lt. Co.	1,000,000	50	110	..
Oakland, Cal.	2,000,000	..	53½	55
" Bonds	750,000	..	..	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	116½	116¾
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,000	1,000	111½	112
2d "	2,500,000	1,000	104	105
Peoples, Jersey City	500,000	50	215	..

Advertisers' Index.

GAS ENGINEERS.

	Page
Wm. Henry White, New York City	759
Fred. Bredel, Milwaukee, Wis.	746
Geo. R. Rowland, New York City	743
The Western Gas Construction Co., Fort Wayne, Ind.	764
Humphreys & Glasgow, New York City	744
American Gas Co., Phila., Pa.	746
David Leavitt Hough, New York City	756
Economical Gas Apparatus Construct'n Co., Toronto, Ont.	743
Baxter & Young, Detroit, Mich	756
United Gas Improvement Co., Phila., Pa	751
James T. Lynn, Detroit, Mich	756
A. E. Boardman, Brevard, N. C.	756
Gilbert & Barker Mfg. Co., New York City	742

GAS WORKS APPARATUS AND CONSTRUCTION.

James R. Floyd's Sons, New York City	760
Continental Iron Works, Brooklyn, N. Y.	758
Deily & Fowler, Phila., Pa.	760
Kerr Murray Mfg. Co., Fort Wayne, Ind	756
Stacey Mfg. Co., Cincinnati, Ohio	759
Bartlett, Hayward & Co., Baltimore, Md.	757
Davis and Farnum Mfg. Co., Waltham, Mass.	756
R. D. Wood & Co., Phila., Pa.	758
Isbell-Porter Company, New York City	758
Fred. Bredel, Milwaukee, Wis.	746
United Gas Improvement Co., Phila., Pa.	751
National Gas and Water Co., Chicago, Ills.	753
Economical Gas Apparatus Construct'n Co., Toronto, Ont.	743
The Western Gas Construction Co., Fort Wayne, Ind.	764
Humphreys & Glasgow, New York City	744
American Gas Co., Phila., Pa.	746
Logan Iron Works, Brooklyn, N. Y.	760
Riter-Conley Mfg. Co., Pittsburgh, Pa.	759
Baxter & Young, Detroit, Mich.	756
Berlin Iron Bridge Co., East Berlin, Conn.	745
G. Shepard Page's Sons, New York City	756
James T. Lynn, Detroit, Mich.	756
A. E. Boardman, Brevard, N. C.	756
Gilbert & Barker Mfg. Co., New York City	742
Sutherland Construction & Improvement Co., N.Y. City	742

PROCESSES.

Bartlett, Hayward & Co., Baltimore, Md.	757
United Gas Improvement Co., Phila., Pa.	751
Burdett Loomis, Hartford, Conn.	758
National Gas and Water Co., Chicago, Ills.	753
Economical Gas Apparatus Construct'n Co., Toronto, Ont.	743
The Western Gas Construction Co., Fort Wayne, Ind.	764
Humphreys & Glasgow, New York City	744
Gilbert & Barker Mfg. Co., New York City	742
Sutherland Construction & Improvement Co., N.Y. City	742
B. E. Chollar, St. Louis, Mo	741

SCRUBBERS AND CONDENSERS.

R. D. Wood & Co., Phila., Pa.	758
James R. Floyd's Sons, New York City	760
Continental Iron Works, Brooklyn, N. Y.	758
Logan Iron Works, Brooklyn, N. Y.	760
Riter-Conley Mfg. Co., Pittsburgh, Pa.	759

TAR AND CARBONIC ACID EXTRACTOR.

R. D. Wood & Co., Phila., Pa.	758

AMMONIA CONCENTRATORS.

Michigan Ammonia Works, Detroit, Mich.	740
American Gas Company, Phila., Pa.	746

GAS METERS.

John J. Griffin & Co., Phila., Pa.	734
American Meter Co., New York and Philadelphia	763
Helme & McIlhenny, Phila., Pa.	763
D. McDonald & Co., Albany, N.Y.	761
Nathaniel Tufts Meter Co., Boston, Mass.	762
Maryland Meter and Mfg. Co., Baltimore, Md.	762
Metric Metal Co., Erie, Pa	763
Keystone Meter Co., Royersford, Pa.	762
Detroit Meter Company, Detroit, Mich.	763

PREPAYMENT METERS.

American Meter Co., New York and Philadelphia	763
John J. Griffin & Co., Phila., Pa.	734
D. McDonald & Co., Albany, N. Y.	761
Helme & McIlhenny, Phila., Pa.	763
Nathaniel Tufts Meter Co., Boston, Mass.	762

GAS AND WATER PIPES.

M. J. Drummond & Co., New York City	761
R. D. Wood & Co., Phila., Pa.	758
Warren Foundry and Machine Co., New York City	761
Donaldson Iron Co., Emaus, Pa.	761

PIPE CUTTERS.

The Anderson Pipe Cutter Co., East Boston, Mass.	743

GAS MAIN STOPPERS.

Safety Gas Main Stopper Co., N. Y. City	742

FLEXIBLE JOINTS.

Campbell Mfg. Co., Stamford, Conn.	700

STEAM BLOWER FOR BURNING BREEZE.

H. E. Parson, Brooklyn, N. Y.	758

GAS COALS.

Penn Gas Coal Co., Phila., Pa.	755
Perkins & Co., New York City	754
Despard Gas Coal Co., Baltimore, Md.	755
Westmoreland Coal Co., Phila., Pa.	755
Berwind-White Coal Mining Co., New York and Phila.	754

CANNEL COALS.

Perkins & Co., New York City 754

CONVEYORS.

The Link-Belt Machinery Co., Chicago, Ills 742

GAS ENRICHERS.

Standard Oil Co., New York City 755
The Sun Oil Co., Pittsburgh, Pa..... 755

COKE CRUSHER.

C. M. Keller, Columbus, Ind..... 755

GAS GAUGES.

The Bristol Co., Waterbury, Conn..... 744

GAS GOVERNORS.

Connelly Iron Sponge and Governor Co., New York City 758
Isbell-Porter Co., New York City..... 758
R. D. Wood & Co., Phila., Pa..... 758
Wm M. Crane Co., New York City..... 741

CEMENTS.

C. L. Gerould, Galesburg, Ills 762

RETORTS AND FIREBRICKS.

J. H. Gautier & Co., Jersey City, N. J..... 752
Adam Weber, New York City..... 752
Laclede Firebrick Mfg. Co., St. Louis, Mo..... 752
Cyrus Borgner, Phila., Pa..... 752
James Gardner, Jr., Pittsburgh, Pa..... 7 2
Henry Maurer & Son, New York City..... 752
Baltimore Retort and Firebrick Co., Baltimore, Md..... 752
Parker-Russell Mining and Mfg. Co., St. Louis, Mo..... 752
Brooklyn Firebrick Works, Brooklyn, N. Y..... 752

REGENERATIVE FURNACES.

Bartlett, Hayward & Co., Baltimore, Md..... 757
Fred. Bredel, Milwaukee, Wis..... 746
J. H. Gautier & Co., Jersey City, N. J..... 752
Parker-Russell Mining and Mfg. Co., St. Louis, Mo..... 752
Adam Weber, New York City..... 752

SELF-SEALING MOUTHPIECE DOORS.

Isbell-Porter Co., New York City..... 758
Continental Iron Works, Brooklyn, N.Y..... 758
Logan Iron Works, Brooklyn, N. Y..... 760
R. D. Wood & Co., Phila., Pa..... 758

INCANDESCENT GAS LAMPS.

Welsbach Commercial Co., Phila., Pa..... 750

BURNERS.

C. A. Gefrorer, Phila., Pa..... 748
Wm. M. Crane Co., New York City 743
D. M. Steward Mfg. Co., Chattanooga, Tenn..... 743

LAVA GAS TIPS.

D. M. Steward Mfg. Co., Chattanooga, Tenn..... 743

STREET LAMPS.

Welsbach Street Lighting Co., New York and Phila..... 748
Thos. T. W. Miner, New York City..... 740

PURIFIERS.

Stacey Mfg. Co., Cincinnati, O..... 741

PURIFYING MATERIALS.

Connelly Iron Sponge and Governor Co., New York City 758
van Baarda & Co., Dusseldorf-on-the-Rhine..... 758

VALVES.

Ludlow Valve Manufacturing Co., Troy, N. Y..... 744
Chapman Valve Manufacturing Co., Boston, Mass..... 744
R. D. Wood & Co., Phila., Pa..... 758
Continental Iron Works, Brooklyn, N. Y..... 758
The P. H. & F. M. Roots Co., Connersville, Ind..... 747
Isbell-Porter Co., New York City..... 758
The Western Gas Construction Co., Fort Wayne Ind.... 764

EXHAUSTERS.

The P. H. & F. M. Roots Co., Connersville, Ind..... 747
Isbell-Porter Company, New York City..... 758
Connelly Iron Sponge and Governor Co., New York City 758

ELECTRICAL APPARATUS.

Wm. Henry White, New York City 759

ENGINES AND BOILERS.

The Hazelton Boiler Company, New York City..... 740

PURIFIER SCREENS.

John Cabot, New York City..... 744

GAS STOVES.

American Meter Co., New York and Philadelphia..... 749
Maryland Meter and Manufacturing Co., Baltimore, Md. 762
Keystone Meter Co., Royersford, Pa..... 762
Wm. M. Crane Co., New York City..... 741
Nathaniel Tufts Meter Co., Boston, Mass..... 762
Gilbert & Barker Mfg. Co., New York City..... 742

HOT WATER HEATERS.

Wm. M. Crane Co., New York City..... 741
Gilbert & Barker Mfg. Co, New York City..... 742

GASHOLDER TANKS.

J P. Whittier, Brooklyn, N. Y..... 744

GASHOLDERS.

Bartlett, Hayward & Co., Baltimore, Md..... 757
Continental Iron Works, Brooklyn, N. Y..... 758
Deily & Fowler, Philadelphia, Pa..... 760
Davis & Farnum Mfg. Co., Waltham, Mass..... 756
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 756
Stacey Mfg. Co., Cincinnati, Ohio..... 759
R. D. Wood & Co., Philadelphia, Pa..... 758
Logan Iron Works, Brooklyn, N. Y..... 760
Riter-Conley Mfg. Co., Pittsburgh, Pa..... 759

GAS SECURITIES.

Henry Marquand & Co., New York City..... 740

PATENTS.

H. S. Thornberry, Washington, D. C..... 761

ADVERTISING.

J. Howland Harding, New York City..... 740

BOOKS, ETC.

Newbigging's Handbook 748
Field's Analysis, 1898..... 745
Scientific Books..... 754
Digest of Gas Cases..... 755
Practical Photometry..... 752
Gas Flow Computers..... 755
Hughes' "Gas Works"..... 758
Gas Engineer's Pocket-Book..... 744
Excerpts from Reports of Gas Commissioners..... 75"
Poole on Fuels..... 723
Binders..... 761
Directory of Gas Companies 759
Practical Handbook on Gas Engines..... 748
Coal Tar Tree 744

Position Wanted

As Superintendent of Gas Works,

By a young man who has had 15 years' experience as Superintendent of gas and electric light plants, and has been nearly 12 years with one Company. Best of references.

1274-tf Address "S.," care this Journal.

FOREMAN.

A working Foreman of an Eastern works wants a position as Superintendent of a gas property.

1274-tf "J. R.," care this Journal.

Position Wanted

As Manager or Engineer of a Gas Company.

A Thoroughly Competent Gas Manager of many years' experience in the manufacturing and the executive ends of a Gas Company desires a position as Manager or Engineer of a Gas Company selling not less than 50,000,000 cubic feet per annum. Highest references given. Address "T.,"

1267-tf Care this Journal.

WANTED,

Second-Hand Station Meter, Purifiers, Condenser, Scrubber, Exhauster and Street Main Governor

For a Gas Works of 50,000 to 60,000 daily capacity. Also Hydraulic Main. Mouthpieces and Connecting Pipes for two Benches of 6's. Parties having all or any part of the above apparatus for sale, Address

1273-tf "W.," care this Journal.

For Sale.

A Small Gas and Electric Light Plant,

in a Southern city of 3,800 inhabitants.

Address FORT WAYNE ELECTRIC CORPORATION,

1097-tf Fort Wayne, Ind.

SECOND-HAND APPARATUS.

am in position to offer at attractive prices, a considerable quantity of good, usable second-hand Gas Apparatus, of various kinds and sizes, such as Purifiers, Station Meters, Exhausters, Scrubbers and Condensers, Bench Ironwork, Water Gas Machinery, Tanks, etc., etc. Gas Companies or Contractors who can use such will find it worth while to write for prices, stating their requirements. Gas Companies having apparatus to dispose of are invited to communicate upon the matter. F. H. SHELTON,

315 Fidelity Building, 112 N. Broad St., Phila.

Utilize Your Gas Liquor.

NO EXTRA LABOR OR OPERATING EXPENSES.

Ammonia Concentrator,

Not Expensive. Write to

STROH & OSIUS, Pat'ees, or Mich. Ammonia Works. Detroit. Mich.

"THE MINER"

Globe Street and Boulevard Lamps.

Cheapest and Best.

THOUSANDS IN USE WITH INCANDESCENT BURNERS.

Send for Catalogues.

THOMAS T. W. MINER,

821-823 Eagle Av., N.Y.

HENRY MARQUAND & CO.,

BANKERS

AND

BROKERS.

160 Broadway, New York City.

PLANS ADVICE WRITING ILLUSTRATING

J. HOWLAND HARDING, ADVERTISING, 1545 BROADWAY, LONG ACRE SQUARE NEW YORK

HIGH PRESSURE **WATER TUBE BOILERS**

Economy, Safety, Capacity, Durability.

THE HAZELTON BOILER

The Pioneer Vertical Water Tube Boiler of the World

STACKS, TANKS AND MISCELLANEOUS METAL WORK

THE HAZELTON BOILER CO.

Sole Manufacturers NEW YORK, U. S. A.

Telephone 1229 18th St. Cable Address "Paila," N. Y.

Every Confectioner

Will appreciate a Gas Stove as represented by the engraving. No dust, no dirt. It is especially made for boiling candy in large or small batches. The several rings allowing different sized kettles to be used 8, 10, 13 and 16 inches. It can be used for baking Crullers and other purposes. The Burner can be regulated to consume 25 to 150 feet of gas per hour as may be required. Many of them are now in use and giving immense satisfaction. . . .

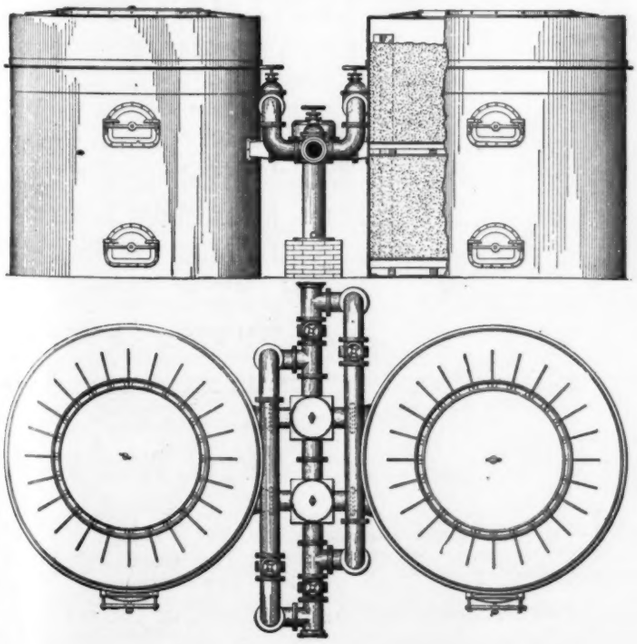
Size No. 16, - 23½ Inches high, 18¾ Inches diameter. List, $20.
Size No. 18, - 26 Inches high, 21 Inches diameter. " $25.
Size No. 20, - 26 Inches high, 27 Inches diameter. " $40.

WE HAVE OTHER APPLIANCES IT WILL PAY TO INTRODUCE.

WILLIAM M. CRANE COMPANY,

1131–1133 Broadway, New York.

FOUNDRY: PEEKSKILL.



CHOLLAR'S SYSTEM OF GAS PURIFICATION.

Covered by Five U. S. Patents.

In operation, revivification of the oxide is effected by repeated reversals of the direction of the flow of the gas through the beds (in the two boxes used under this system there are eight different routes for the gas to take) whereby the purified gas is made to revive the oxide in parts of the apparatus while the foul gas is fouling it in others.

The boxes are charged or discharged from the sides as well as the top.

There are no Hydraulic Cups or heavy covers.

Either end of the apparatus is inlet or outlet at pleasure.

The capacity is increased five-fold or more over ordinary methods without addition to building.

The apparatus costs less than for any other system.

For Estimates Write **The Stacey Mfg. Co.,**
SOLE MANUFACTURERS,
FOR FURTHER INFORMATION WRITE **CINCINNATI, OHIO.**
B. E. CHOLLAR, 411 N. 11th St., St. Louis, Mo.

Coal Tar Genealogical Tree.

Mr. T. Viner Clarke, of London, Eng., having compiled a novel Chart or Map illustrating the various CHEMICAL PRODUCTS DERIVED FROM COAL AND COAL TAR, in the form of a Genealogical Tree, including all the products discovered (the total number amounting to near 700), offers for sale a limited number of copies in Colors, mounted on Linen, with Rollers. Price, $3.50. Orders may be sent to

A. M. CALLENDER & CO., No. 32 Pine Street New York.

Sutherland Construction & Improvement Co.

Offices: 15 WALL ST., NEW YORK, and OSHKOSH, WISCONSIN

Owners of the "SUTHERLAND" Patents for Water Gas Apparatus.

Gas, Electric Light, Water Works, and Electric Street Railways Built, Remodeled, Operated, Bought and Sold.

A few of the places where the SUTHERLAND Apparatus is in successful operation:

Ilion, N. Y.
Herkimer, N. Y., 2 orders.
Little Falls, N. Y.
Fishkill-on-Hudson, 2 orders.
Clifton Springs, N.Y., 2 orders.
Green Bay, Wis.
Stevens Point, Wis.
Tarrytown, N.Y., 3 orders.
Ft. Henry, N. Y.
Gainsville, Fla.
Hollidaysburg, Pa.
Waterville, N. Y.
Huntington, L. I.
Lexington, Mo.
Mendota, Ill.
Circleville, O.
Joplin, Mo.
Ashville, N. C.
Youngstown, O.
Kingston & Rondout, N. Y.

CORRESPONDENCE SOLICITED.

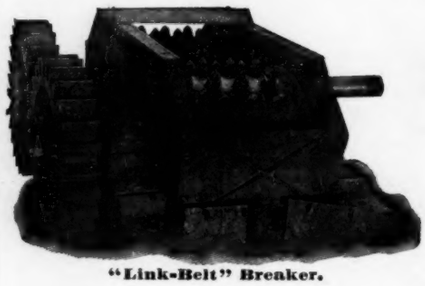
SAFETY GAS MAIN STOPPER CO.

211-E. 116 TH ST. N.Y.

FOR SHUTTING OFF GAS IN MAINS TEMPORARILY DURING ALTERATIONS AND REPAIRS

THE LINK-BELT MACHINERY CO.,

ENGINEERS, FOUNDERS, MACHINISTS,
Chicago, U. S. A.



"Link-Belt" Breaker.

LINK-BELT ELEVATING & CONVEYING MACHINERY for HANDLING COAL, COKE, OXIDE, ETC

Tilting Coal and Coke Cars,
Breaker Rolls, Shaking Screens,
Power Transmitting Machinery.

Machinery designed and erected to suit existing conditions and available space.

CATALOGUE UPON APPLICATION.

GILBERT & BARKER MFG. CO., 82 John Street, New York.

Gas Engineers and Contractors.

Gas Works constructed for Villages up to 1,000 Burners, using either Gasolene or Acetylene.

FUEL GAS FOR ALL MANUFACTURING PURPOSES, FOR COOKING AND LAUNDRY WORK, AND FOR DRIVING GAS ENGINES AND CALORIC PUMPING ENGINES.

We refer to the following Incorporated Gas Companies, using our plants: Merchants Gas Co., Norwich, N. Y.; Merchants Gas Co., So. Otselic, N. Y.; So. New Berlin Gas Co., So. New Berlin, N. Y.; Afton Gas Co., Afton, N. Y.; DeRuyter Gas Co., DeRuyter, N. Y.; Bainbridge Gas Co., Bainbridge, N. Y.; Commercial Gas Light Co., Oxford, N. Y.; West Winfield Gas Co., West Winfield, N. Y.

W. H. PEARSON, Prest. W. H. PEARSON, Jr., Vice-President. J. T. WESTCOTT, M.E., Manager. L. L. MERRIFIELD, M.Inst.M.E., Chief Engineer.

THE ECONOMICAL GAS APPARATUS CONSTRUCTION CO., LD.

American Offices: 269 FRONT STREET, EAST, TORONTO, ONT.
London Offices: 19 ABINGDON STREET, WESTMINSTER, S.W.

Telegraphic Address: "CARBURETED LONDON AND TORONTO."

The above Company have erected since 1893, or are now erecting, their universal type of Carbureted Water Gas Plants at the following Gas Works:

	Cubic Feet Daily.		Cubic Feet Daily.
Blackburn, Eng.	1,250,000	Kingston, Pa.	125,000
Windsor Street Works, Birmingham, Eng.	2,000,000	Montreal,	500,000
Saltley Works, Birmingham, Eng.	2,000,000	Peterborough, Ont.	250,000
Colchester, Eng.	300,000	Wilkesbarre, Pa.	750,000
Birkenhead, Eng.	2,250,000	St. Catherine's (Second Contract),	250,000
Swindon (New Swindon Gas Co.), Eng.	120,000	Buffalo, N. Y.	2,000,000
Saltley Works, Birmingham, Eng. (2d Contract)	2,000,000	Winnipeg, Man.	500,000
Windsor St. W'ks, Birming'm, Eng. (2d Contract)	2,000,000	Colchester, Eng. (Second Contract),	300,000
Halifax, Eng.	1,000,000	York, Eng.	750,000
Toronto,	250,000	Rochester, Eng.	500,000
Ottawa,	250,000	Kingston, Ont.	300,000
Toronto (Second Contract, Remodeled),	2,000,000	Crystal Palace District, Eng.	2,000,000
Lindsay (Remodeled),	125,000	Duluth, Minn.	300,000
Belleville,	250,000	Caterham, Eng.	150,000
Ottawa (Second Contract),	250,000	Enschede, Holland,	150,000
Brantford (Remodeled)	200,000	Leicester, Eng.	2,000,000
St. Catherine's (Remodeled),	250,000	Buenos Ayres (River Platte Co.),	700,000

Steward's BURNERS.

HIGHEST QUALITY.

The only Burner in its class that is

MADE IN AMERICA.

The D. M. Steward Mfg. Co.,

New York Office, 107 CHAMBERS ST. CHATTANOOGA, Tenn.

GEORGE R. ROWLAND.

Formerly with the Continental Iron Works.

Draughtsman and Constructing Engineer.

Drawings, Specifications and Estimates furnished for the construction of new works or alteration of old works. Special attention given to Patent Office drawings.

Office, No. 245 Broadway, N. Y. City.

Practical Photometry.

By William Joseph Dibdin

Price, $3.00.

A. M. CALLENDER & CO., 32 PINE ST., N. Y. CITY

IF BRAY'S SPECIAL BURNERS ARE THE BEST,

Send for OUR BLUE BOOK ON GAS LIGHTING.

Surpass the ordinary, so-called "lava" tip by as much as the ordinary gas burner surpasses the candle of our forefathers.

You Cannot Afford to Use Any Other.

Used throughout the world by the leading Gas Companies. Used for Standard Test by New York, Chicago and the leading cities of the United States.

Gem Self-Lighting Burner, with Bray Regulator (or Tip).

Union-Jet Special.

Sole Agents for the United States.

W. M. CRANE COMPANY,

1131 & 1133 Broadway, New York.

THE ANDERSON Patent Cutter Carrying Link
Made in all sizes.

Will cut from 2 in. to 24 in.
Pipe Cutting Tool

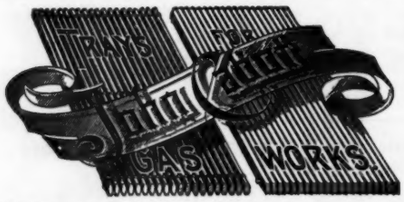
For Cutting Cast, Wrought Iron, Gas & Water Pipes.

THE ANDERSON PIPE CUTTER COMPANY, Manufacturers, 163 Liverpool st., E. Boston, Mass
N. Y. Office, 135 Greenwich St
C. H. TUCKER, JR., Manager.
WALDO BROS., 102 Milk Street, Boston, Mass.

Special Trays for Iron Sponge or Oxide of Iron,

CHURCH'S TRAYS a Specialty.

Reversible, Strongest, Most Durable, Most Easily Repaired.



553-557 West Thirty-third Street, New York.

We also make the Cheapest and Strongest
REVERSIBLE BOLTED TRAYS IN THE MARKET.
Send for Circulars.

Bristol's Recording
PRESSURE GAUGE.

For continuous records of
Street Gas Pressure.
Simple in construction, accurate in operation, and low in price.

Fully Guaranteed. Send for Circulars.

THE BRISTOL CO.,
Waterbury, Conn.

GASHOLDER TANKS AND GAS WORKS MASONRY COMPLETE

Plans prepared and Estimates furnished at short notice.

J. P. WHITTIER,

70 Rush St., Near Division Ave., **Brooklyn, N. Y.**

ALEX. C. HUMPHREYS, M.E., M. Inst. C.E. ARTHUR G. GLASGOW, M.E., M. Inst. C.E.

HUMPHREYS & GLASGOW,

BANK OF COMMERCE BLDG.,
31 Nassau Street,
New York.

9 VICTORIA STREET
London, S. W.,
England.

CONSULTING GAS ENGINEERS AND MANAGERS.
GAS PROPERTIES PURCHASED.

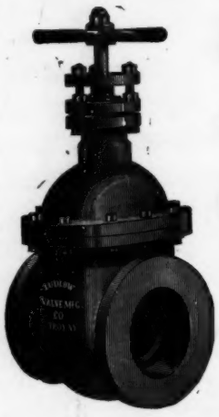
CHAPMAN VALVE MANUFACTURING CO.

MANUFACTURERS OF

Valves and Gates for Gas, Ammonia, Water, Etc.

Also, Gate Fire Hydrants with and without Independent Nozzle Valve. All Work Guaranteed.

Works & Gen'l Office, Indian Orchard, Mass. Treasurer's Office, 72 Kilby & 112 Milk Sts., Boston, Mass.
Chicago Office, 24 West Lake St. New York Office, 28 Platt St.
St. Louis Office, L. M. Rumsey Mfg. Co., 810 North Second St.



THE

Ludlow Valve Mfg. Co.,

TROY, N. Y., U. S. A.

Double and Single Gate Valves, ¼" to 72",

—FOR—

Gas, Water, Steam, Oil, Ammonia, Etc.

HOT GAS VALVES A SPECIALTY.

Send for Catalogue.

THE GAS ENGINEER'S POCKET-BOOK.

By HENRY O'CONNOR.

Comprising Tables, Notes and Memoranda relating to the Manufacture, Distribution and Use of Coal Gas, and the Construction of Gas Works.

Price, - - $3.50.

A. M. CALLENDER & COMPANY, No. 32 Pine Street, N. Y. City.

Coal Tar Genealogical Tree

MR. T. VINER CLARKE, of London, Eng.,

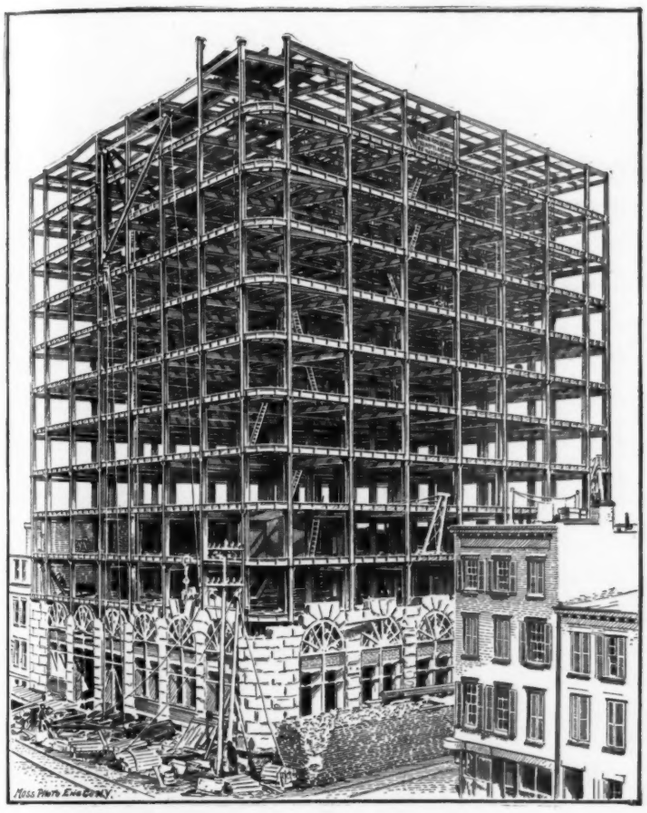
Having compiled a novel Chart or Map illustrating the various

CHEMICAL PRODUCTS DERIVED FROM COAL AND COAL TAR,

In the form of a Genealogical Tree, including all the products discovered to date (the total number amounting to near 700), offers for sale a limited number of copies in Colors, mounted on Linen, with Rollers. Price, $3.50. Orders may be sent to

A. M. CALLENDER & CO., - - No. 32 Pine Street, New York.

CHARLES M. JARVIS, President. GEORGE H. SAGE, Secretary F. L. WILCOX, Treasurer.



THE BERLIN IRON BRIDGE COMPANY,

Engineers, Architects,

AND

Builders of Steel Structures.

The accompanying illustration is taken direct from a photograph made during construction, and shows a Steel Framework for the Fireproof Warehouse designed and built by us for James Everard, on the corner of Washington and Tenth Streets, New York, N. Y.

Main Office and Works,

EAST BERLIN, CONNECTICUT.

BOSTON OFFICE, 200 Equitable Building.
NEW YORK OFFICE, 718 Bennet Building, Cor. Fulton and Nassau Streets.

FIELD'S ANALYSIS

For the Year 1898.

An Analysis of the Accounts of the Principal Gas Undertakings in England, Scotland, and Ireland. Being the Thirtieth Year of Publication. Compiled and Arranged by

JOHN W. FIELD,

Secretary and General Manager of The Gas Light and Coke Co., London.

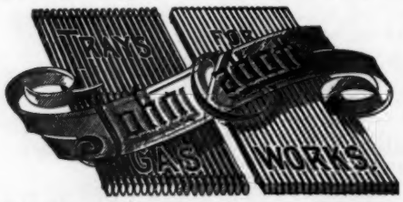
Price $5. For Sale by

A. M. CALLENDER & CO., - No 32 Pine Street, N. Y. City.

Special Trays for Iron Sponge or Oxide of Iron,

CHURCH'S TRAYS a Specialty.

Reversible, Strongest, Most Durable, Most Easily Repaired.



553-557 West Thirty-third Street, New York.

We also make the Cheapest and Strongest
REVERSIBLE BOLTED TRAYS IN THE MARKET.
Send for Circulars.

Bristol's Recording
PRESSURE GAUGE.

For continuous records of **Street Gas Pressure.** Simple in construction, accurate in operation, and low in price.

Fully Guaranteed. Send for Circulars.

THE BRISTOL CO.,
Waterbury, Conn.

GASHOLDER TANKS AND GAS WORKS MASONRY COMPLETE

Plans prepared and Estimates furnished at short notice.

J. P. WHITTIER,

70 Rush St., Near Division Ave., **Brooklyn, N. Y.**

ALEX. C. HUMPHREYS, M. E., M. nst. C. E. ARTHUR G. GLASGOW, M. E., M. Inst. C. E.

HUMPHREYS & GLASGOW,

BANK OF COMMERCE BLDG.,
31 Nassau Street,
New York.

9 VICTORIA STREET
London, S. W.,
England.

CONSULTING GAS ENGINEERS AND MANAGERS.
GAS PROPERTIES PURCHASED.

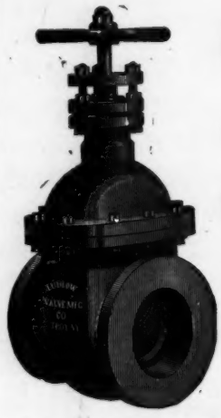
CHAPMAN VALVE MANUFACTURING CO.

MANUFACTURERS OF

Valves and Gates for Gas, Ammonia, Water, Etc.

Also, Gate Fire Hydrants with and without Independent Nozzle Valve. All Work Guaranteed.

Works & Gen'l Office, Indian Orchard, Mass. Treasurer's Office, 72 Kilby & 112 Milk Sts., Boston, Mass.
Chicago Office, 24 West Lake St. New York Office, 28 Platt St.
St. Louis Office, L. M. Rumsey Mfg. Co., 810 North Second St.



THE

Ludlow Valve Mfg. Co.,

TROY, N. Y., U. S. A.

Double and Single Gate Valves, ¼" to 72",

—FOR—

Gas, Water, Steam, Oil, Ammonia, Etc.

HOT GAS VALVES A SPECIALTY.

Send for Catalogue.

THE GAS ENGINEER'S POCKET-BOOK.

By HENRY O'CONNOR.

Comprising Tables, Notes and Memoranda relating to the Manufacture, Distribution and Use of Coal Gas, and the Construction of Gas Works.

Price, - - $3.50.

A. M. CALLENDER & COMPANY, No. 32 Pine Street, N. Y. City.

Coal Tar Genealogical Tree

MR. T. VINER CLARKE, of London, Eng.,

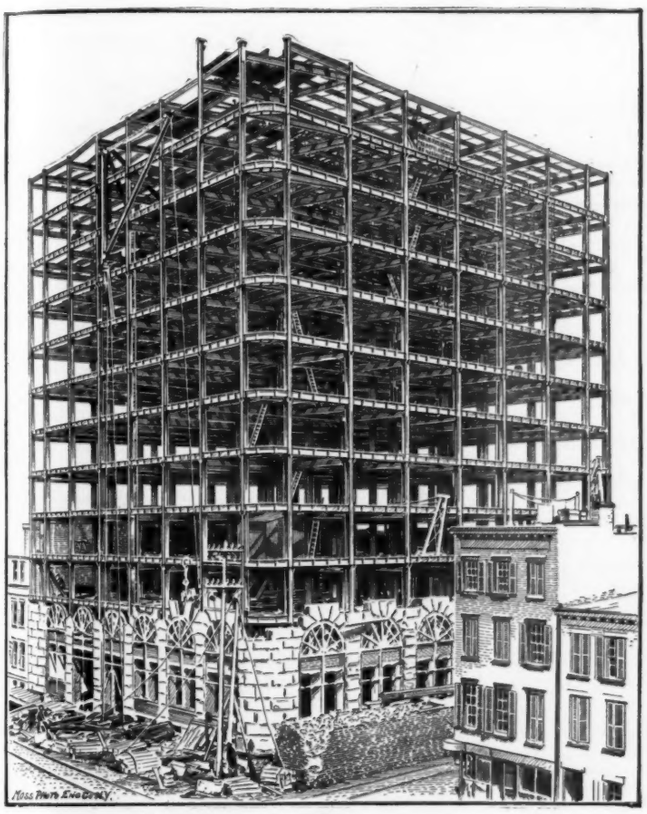
Having compiled a novel Chart or Map illustrating the various

CHEMICAL PRODUCTS DERIVED FROM COAL AND COAL TAR,

In the form of a Genealogical Tree, including all the products discovered to date (the total number amounting to near 700), offers for sale a limited number of copies in Colors, mounted on Linen, with Rollers. Price, $3.50. Orders may be sent to

A. M. CALLENDER & CO., - - No. 32 Pine Street, New York.

CHARLES M. JARVIS, President. GEORGE H. SAGE, Secretary F. L. WILCOX, Treasurer.



THE BERLIN IRON BRIDGE COMPANY,

Engineers, Architects,

AND

Builders of Steel Structures.

The accompanying illustration is taken direct from a photograph made during construction, and shows a Steel Framework for the Fireproof Warehouse designed and built by us for James Everard, on the corner of Washington and Tenth Streets, New York, N. Y.

Main Office and Works,

EAST BERLIN, CONNECTICUT.

BOSTON OFFICE, 200 Equitable Building.
NEW YORK OFFICE, 718 Bennet Building, Cor. Fulton and Nassau Streets.

FIELD'S ANALYSIS

For the Year 1898.

An Analysis of the Accounts of the Principal Gas Undertakings in England, Scotland, and Ireland. Being the Thirtieth Year of Publication. Compiled and Arranged by

JOHN W. FIELD,

Secretary and General Manager of The Gas Light and Coke Co., London.

Price $5. For Sale by

A. M. CALLENDER & CO., - No 32 Pine Street, N. Y. City.

AMERICAN GAS COMPANY

Constructors of Coal Gas Apparatus.

KLONNE-BREDEL

Recuperative Furnaces, Washers, Condensers, Purifiers and Purifying Machines, Ammonia Plant, Coke Conveyers, Etc.

Complete Works Erected with Guaranteed Results.

EASTERN AGENTS FOR

FRED. BREDEL'S SYSTEM
COAL GAS PLANTS AND GAS APPARATUS.

P. H. & F. M. ROOTS CO.'S
Exhausters, Blowers, etc.

222 South Third Street, Philadelphia, Pa.

GEORGE G. RAMSDELL, General Manager. **Correspondence Solicited**

FRED. BREDEL, C.E.

Coal and Water Gas Plants.

OWN SYSTEM.

RECUPERATIVE FURNACES, WASHERS, CONDENSERS, PURIFIERS, PURIFYING MACHINES, COKE CONVEYERS, ETC

SOLE UNITED STATES AGENT FOR
ARROL-FOULIS MECHANICAL CHARGING AND DRAWING MACHINES.

Gas Enriching Plants to Enrich Coal Gas up to 24 Candle Power, and Making a White, Bright, Non-smoking Gas

GAS RETORTS AND SPECIAL BLOCKS AND FIREBRICK MANUFACTURED UNDER THE SUPERINTENDENCE OF MY OWN CHEMIST.

COMPLETE GAS WORKS

No. 118 Farwell Avenue, · Milwaukee, Wis.

Eastern Agents: AMERICAN GAS CO., Construction Department, 222 So. 3d St., Phila., Pa

ROOTS'

LATEST IMPROVED GAS EXHAUSTER

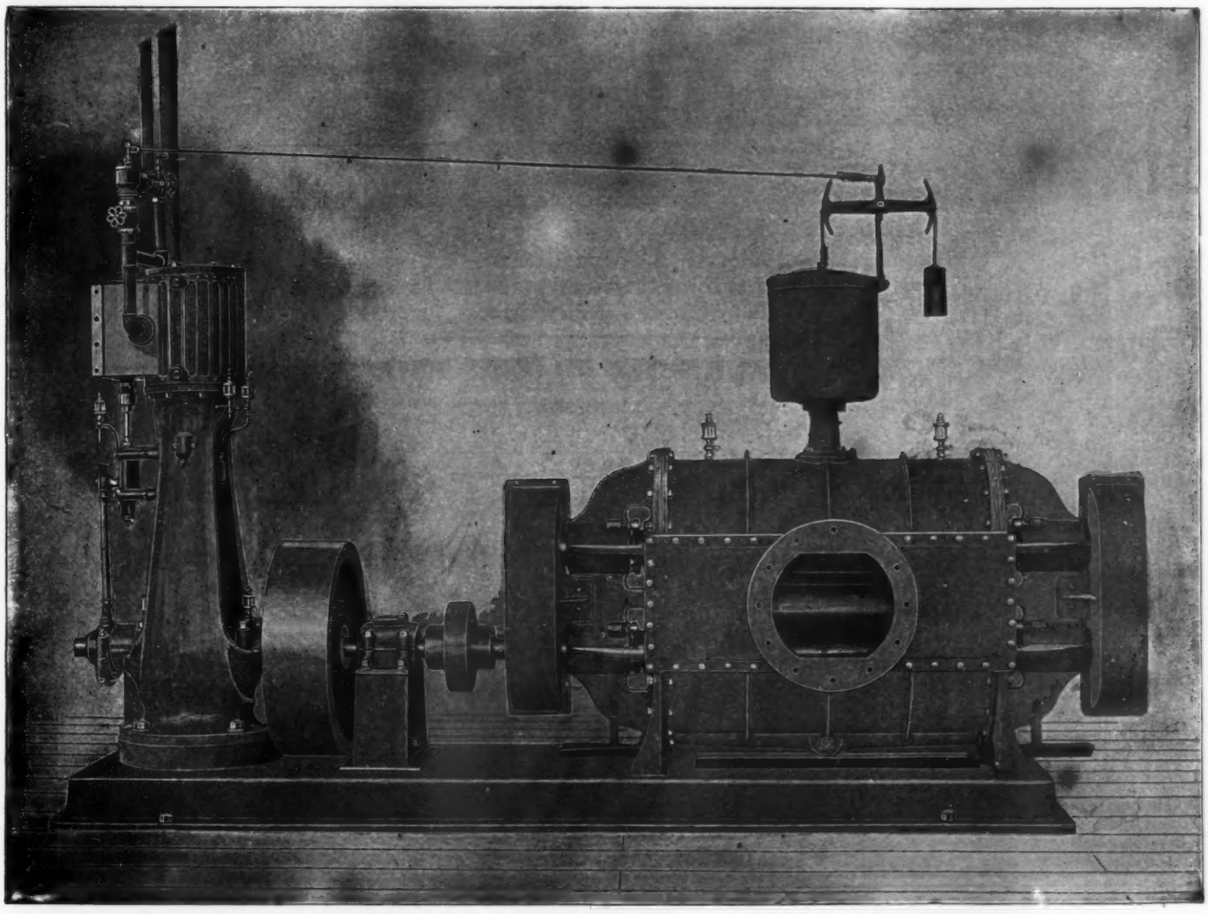
—AND—

NEW GAS GOVERNOR AND STEAM VALVE.

GUARANTEED TO REGULATE WITHIN ONE-TENTH OF AN INCH, WATER PRESSURE.

The Most Perfect Gas Governor on the Market.

MORE DIRECT IN ACTION. FEWER PARTS.
EASIER TO ADJUST THAN ANY OTHER GOVERNOR.



INQUIRIES CHEERFULLY ANSWERED. WRITE FOR CATALOGUE.

P. H. & F. M. ROOTS CO.,

Connersville, Ind. 109 Liberty St., New York.

Eastern Office:

American Gas Company,

222 South Third Street, Philadelphia, Pa.

New York, 33 Nassau St. Philadelphia, Broad and Arch Sts. Chicago, 54 Lake St.

WELSBACH STREET LIGHTING COMPANY OF AMERICA,

—OWNS, CONTROLS AND OPERATES—
EXCLUSIVELY

THE NEW IMPROVED AND PATENTED STREET LIGHT BURNER.

STYLE No. 81.

Our PATENTED "STREET LIGHT APPLIANCES" have made WELSBACH STREET LIGHTING a complete success.

By the UNIFORM DISTRIBUTION of light on scientific principles a greater area can be lighted by our system and more economically than in any other way.

Where there are no gas mains already laid, we can furnish an equally good light by our **SELF-GENERATING NAPHTHA WELSBACH BURNER**, enabling Gas Companies to furnish a uniform light in all localities.

Lists of Cities and Towns in which we are now lighting under contract will be furnished upon application.

STYLE No. 97.

CORRESPONDENCE SOLICITED FROM GAS COMPANIES AND OTHERS INTERESTED IN MUNICIPAL LIGHTING.

NOW READY.

THE SIXTH (AND CENTENARY) EDITION
— OF THE —

Handbook for Gas Engineers and Managers.

By THOMAS NEWBIGGING, M. Inst. C.E.

This Edition of the "Handbook for Gas Engineers and Managers" is a great improvement on all previous editions. Much of the text has been re-written, in order to keep the work abreast of the constant advances that are being made in the Gas Industry.

PRICE, - - $6.00.

A. M. CALLENDER & CO., - - No. 32 Pine Street, N. Y. City.

PRACTICAL HANDBOOK ON

GAS ENGINES

With Instructions for Care and Working of the Same.

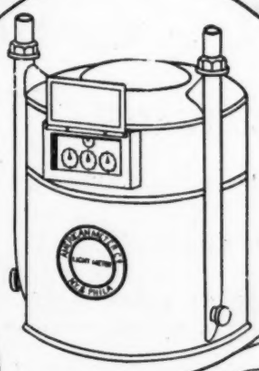
By G. LIECKFELD, C.E.

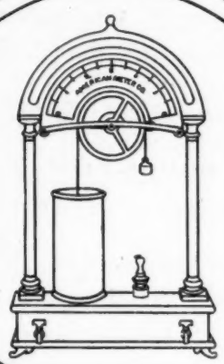
Translated with Permission of the author by GEO. M. RICHMOND, M.E.

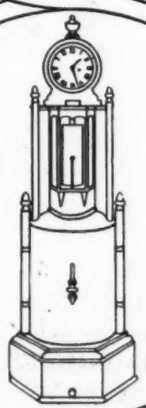
Price, $1.00.

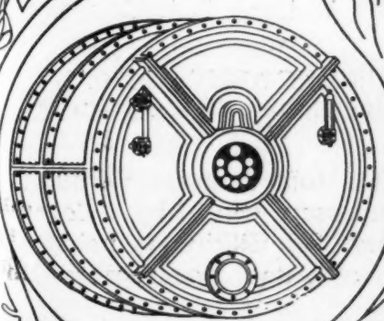
A. M. CALLENDER & CO., 32 Pine Street, New York.

(Copyrighted, 1894, by the AMERICAN METER CO.









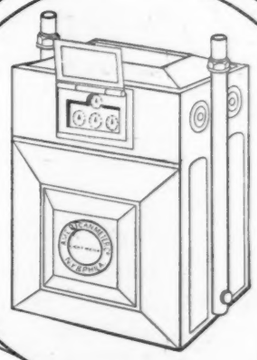
AMERICAN METER CO.

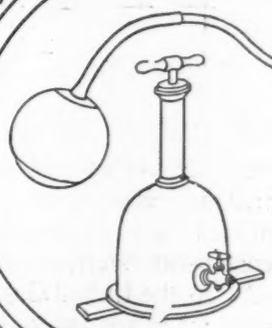
ESTABLISHED 1834. INCORPORATED 1863.

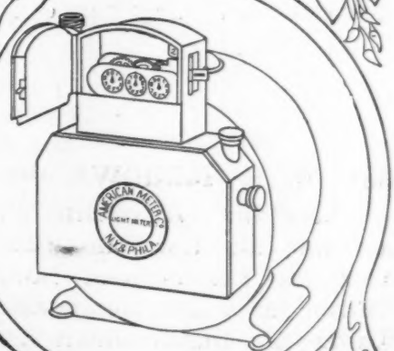
NEW YORK AND PHILADELPHIA,

CHICAGO, ST. LOUIS,

SAN FRANCISCO.







PUBLIC LIGHTING TABLE.

NOVEMBER, 1899.

Day of Week.	Table No. 1. Following the Moon.			Table No. 2. New York City. All Night Lighting.	
	Date.	Light.	Extinguish.	Light.	Extinguish.
				P.M.	A.M.
Wed.	1	5.30 PM	5.30 AM	4.45	5.35
Thu.	2	5.30 NM	5.30	4.45	5.35
Fri.	3	5.30	5.30	4.45	5.35
Sat.	4	5.30	5.30	4.45	5.35
Sun.	5	5.20	5.40	4.40	5.45
Mon.	6	5.20	5.40	4.40	5.45
Tue.	7	7.30	5.40	4.40	5.45
Wed.	8	8.40	5.40	4.40	5.45
Thu.	9	9.50	5.40	4.40	5 45
Fri.	10	11.00 FQ	5.40	4.40	5.45
Sat.	11	12.10 AM	5.40	4.40	5.45
Sun.	12	1.20	5.40	4.30	6.00
Mon.	13	2.30	5.40	4.30	6.00
Tue.	14	3.40	5.40	4.30	6.00
Wed.	15	No L.	No L.	4.30	6.00
Thu.	16	No L. FM	No L.	4.30	6.00
Fri.	17	No L.	No L.	4.30	6.00
Sat.	18	5.10 PM	6.40 PM	4.30	6.00
Sun.	19	5.10	7.40	4.25	6.00
Mon.	20	5.10	8.30	4.25	6.00
Tue.	21	5.10	9.30	4.25	6.00
Wed.	22	5.10	10.30	4.25	6.00
Thu.	23	5.10	11.30	4.25	6.00
Fri.	24	5.10 LQ	12.30 AM	4.25	6.00
Sat.	25	5.10	1.30	4.25	6.00
Sun.	26	5.10	2.30	4.20	6.10
Mon.	27	5.10	3.30	4.20	6.10
Tue.	28	5.10	4.30	4.20	6.10
Wed.	29	5.10	6.00	4.20	6.10
Thu.	30	5.10	6.00	4.20	6.10

TOTAL HOURS LIGHTING DURING 1899.

By Table No. 1.	Hrs. Min.	By Table No. 2.	Hrs. Min.
January	215.40	January	423.20
February	184.40	February	355.25
March	187.40	March	355.35
April	166.50	April	298.50
May	158.00	May	264.50
June	140.50	June	234.25
July	150.30	July	243.45
August	168.30	August	280.25
September	179.50	September	321.15
October	213.20	October	374.30
November	217.00	November	401.40
December	238.10	December	433.45
Total, yr.	2221.00	Total, yr.	3987.45

OFFICE OF THE

Welsbach Light Co.,

BROAD AND ARCH STREETS,

PHILADELPHIA, PA., June 23, 1899.

To the Stockholders of the Welsbach Light Company:

In answer to the many inquiries received from the stockholders as to whether the Welsbach Light Company is interested in the Kern Light or the Kern Incandescent Gas Light Company, I am authorized by the Board of Directors of this Company to advise you that **THIS COMPANY IS NOT NOW AND NEVER HAS BEEN INTERESTED IN EITHER THE KERN LIGHT OR THE KERN INCANDESCENT GAS LIGHT COMPANY. The Kern Light, or, to designate it more properly, the Kern Bunsen Burner for use with an incandescent mantle, and the United States patents upon which it is based, were offered to this Company, which refused to purchase them upon the advice of its experts, Dr. Charles F. Chandler, of Columbia College, and Dr. Waldron Shapleigh, its Chief Chemist, and of its Patent Council, Mr. John R. Bennett, of New York City.**

This Company is not now and never has been interested in the Welsbach Incandescent Gas Light Company of England, nor is that Company interested in this Company. Your attention is called to the following correspondence, which defines **THE POSITION OF THE UNITED GAS IMPROVEMENT COMPANY**, whose name is mentioned in the advertisements which offer for subscription the stock of the Kern Incandescent Gas Light Company.

WELSBACH LIGHT COMPANY,
W. E. BARROWS, President.

WELSBACH LIGHT CO.,

BROAD AND ARCH STREETS,

PHILADELPHIA, PA., June 23d, 1899.

MR. THOMAS DOLAN, President the United Gas Improvement Company:

DEAR SIR: In yesterday's and to-day's New York and Philadelphia papers appear the advertisements of the International Banking and Trust Company soliciting subscriptions to the Capital Stock of the Kern Incandescent Gas Light Company. Among the names of the Directors of the said Trust Company published in the advertisements referred to appears the name of "George W. Elkins, United Gas Improvement Company, Philadelphia." As the United Gas Improvement Company has been prominently identified with the Welsbach Light ever since its introduction into the United States, the publication of its name in these advertisements, which also contain suggestions hostile to this Company, has greatly disquieted many of our shareholders. If you are willing to give me an authoritative statement of the position of the United Gas Improvement Company I shall be greatly obliged. Very truly yours,

W. E. BARROWS, President Welsbach Light Company.

THE UNITED GAS IMPROVEMENT COMPANY,
Broad and Arch Sts., Philadelphia, June 23d, 1899.

COL. W. E. BARROWS, President Welsbach Light Company:

Dear Sir: Answering your favor of even date, the United Gas Improvement Company is not now and never has been interested either in the Kern Incandescent Gas Light Company or in the International Banking and Trust Company. Mr. George W. Elkins is neither an Officer nor a Director of the United Gas Improvement Company, and does not represent the United Gas Improvement Company. Very truly yours,

THOMAS DOLAN, President,
United Gas Improvement Company.

The United Gas Improvement Company,

Broad and Arch Streets, Philadelphia.

THE STANDARD JUNIOR,

THE STANDARD DOUBLE SUPERHEATER,

LOWE WATER GAS APPARATUS.

Under Contract, 1899:

	SETS.	DAILY CAPACITY.
Fostoria, O.	1	250,000 Cubic Feet.
Derby, Conn.	1	750,000 "
Lowell, Mass.	1	1,000,000 "
Doylestown, Pa.	1	50,000 "
Darby, Pa.	1	400,000 "
Adrian, Mich.	1	125,000 "
Concord, N. H.	1	400,000 "
Sioux City, Iowa	1	750,000 "
Standard Gas Light Co., New York	3	5,400,000 "
Peekskill, N. Y.	1	250,000 "
Westchester, N. Y.	1	250,000 "
Jersey City, N. J.	1	1,000,000 "
Stapleton, N. Y.	1	750,000 "
London, O.	1	125,000 "
Chicago, Ills.	2	3,600,000 "
Putnam, Conn.	1	125,000 "
Mansfield, O.	1	250,000 "
Plymouth, Pa.	1	125,000 "
Athens, Pa.	1	125,000 "
Charlotte, N. C.	1	250,000 "
Consolidated Gas Co., New York	2	2,000,000 "
Quincy, Ills.	1	250,000 "
Boone, Ia.	1	125,000 "
Webster, Mass.	1	50,000 "
Flushing, N. Y.	1	250,000 "
Total	29	18,650,000 "
Previously built	294	187,100,000 "
Grand Total	323	205,750,000 "

Established 1858. Incorporated 1890.
CHAS. E. GREGORY Prest. DAVID R. DALY V. Prest. & Treas.
H. D. ABERNETHY. Sec.

J. H. Gautier & Co.

Greene & Essex Streets,
Jersey City, N. J.

MANUFACTURERS OF

CLAY GAS RETORTS, FIRE CLAY TILES,
FIRE BRICK and FIRE CLAY SPECIALTIES.

Ground Fire Clay, Fire Sand and Ground Fire Brick in Barrels and Bulk.

SOLE MANUFACTURERS OF THE

FLEMMING GENERATOR GAS FURNACE

E. D. WHITE, President. A. H. GUTKES, Vice-President. H. A. PERKINS, Secretary.

Brooklyn Fire Brick Works,

MANUFACTURERS OF

CLAY RETORTS, FIRE BRICK,
Gas House and other Tile.

Office, 88 Van Dyke St. Brooklyn, N. Y.

Established 1854. Incorporated 1869.

LACLEDE
Fire Brick Manufg. Co.,

Manufacturers of { GAS RETORTS . .
FIRE BRICK . . .
RETORT SETTINGS

Water Gas Cupola Linings, Fire Clay, Etc.

Exclusive Agents for

The Mitchell Half-Depth Regenerative Furnace.

This is the *original* coal-consuming Furnace for Retort Benches. Burns either Coal or Coke. Full and Half-Depth Regenerative Furnaces for Benches of 6's, 7's, 8's or 9's erected complete.

Proprietors of the Coze System of Inclined Retorts.

Office: 901 Pine St., **St. Louis, Mo.**

The Construction of Gas Works

PRACTICALLY DESCRIBED,

By WALTER RALPH HERRING.

Price $2. For Sale by

A. M. CALLENDER & CO.,

32 Pine Street, N. Y. City.

Adam Weber,

Proprietor,

Manhattan Fire Brick and Enameled Clay Retort Works.

Works, Weber, N. J.

Office, 633 East 15th St., New York.

Modern Recuperative Furnaces

And Standard Fire Brick and Gas Retorts.

Works, LOCKPORT STATION, PA.

—ESTABLISHED 1864.—

JAMES GARDNER, JR.,

Hamilton Building, Fifth Avenue. PITTSBURGH, PA. P. O. Box 373.

Successor to WILLIAM GARDNER & SON

Fire Clay Goods for Gas Works.

SOLE REPRESENTATIVE OF THE McILHENNY REGENERATIVE BENCHES FOR THE U. S.

HENRY MAURER & SON,

(ESTABLISHED 1856.)

EXCELSIOR FIRE BRICK & CLAY

RETORT WORKS

WORKS, Perth Amboy, N. J.

OFFICE, 418 to 422 East 23d St., N. Y.

Clay Gas Retorts,

BENCH SETTINGS,

Fire Brick, Tiles, Etc.

GEROULD'S IMPROVED RETORT CEMENT

A Cement of great value for patching retorts, putting on mouthpieces, making up all bench-work joints, lining blast furnaces and cupolas. This cement is mixed ready for use. Economic and thorough in its work. Fully warranted to stick.

Price List, f.o.b. Galesburg or Mount Vernon.

In Casks, 400 to 800 pounds, at 5 cents per pound.
In Kegs, 100 to 200 " " 6 " "
In Kegs less than 100 " " 7 " "

C. L. GEROULD, Galesburg, Ills.

Eastern Agent. PERRY BORDEN, 19 Prospect Ave., MOUNT VERNON, N. Y.

Parker-Russell Mining and Mfg. Co.,

CITY OFFICE,

417 Pine Street, St. Louis, Mo.

PROPRIETORS OF THE

OAKHILL GAS RETORT & FIRE BRICK W'KS

Our immense establishment is now employed almost entirely in the manufacture of

Materials for Gas Companies

We have studied and perfected three important points. Our retorts are made to stand changes of temperature, the strongest heats of the furnace, and the abrasion of feeding and emptying. We construct

Half and Full Depth Benches of Our Own Design,

Containing 6, 8 or 9 Retorts.

We have Greatly Improved our Recuperators. Coal or Coke can be used as Fuel in Furnaces.

THEO. J. SMITH, Prest. J. A. TAYLOR, Secy
A. LAMBLA, Vice-Prest. and Supt.

BALTIMORE
RETORT & FIRE BRICK CO.

MANUFACTORY AT

LOCUST POINT BALTIMORE MD.

Clay Retorts, Blocks & Tiles

FIRE BRICK, FIRE CLAY,
AND FIRE CEMENT.

Red and Buff Ornamental Tiles and Chimney Tops. Baker Oven Tiles 12x12x2 and 10x10x2.

WALDO BROS., 102 MILK ST., BOSTON, MASS.

Sole Agents for New England States.

PRACTICAL PHOTOMETRY.

A Guide to the Study of the Measurement of Light.

By WILLIAM JOSEPH DIBDIN.

With Numerous Illustrations. Price, $3.00. A. M. CALLENDER & CO., 32 Pine Street, N. Y. City

National Gas and Water Company.

CONTRACTORS FOR
Gas Plant Machinery

SOFT COAL OR COKE
WATER GAS GENERATORS
A SPECIALTY.

218 LA SALLE ST.,
CHICAGO.

Gas Engineers
INSPECTION AND ADVICE.

PLANS AND ESTIMATES
FOR IMPROVEMENTS OR
REPAIRS.

CONNELLY IRON SPONGE AND GOVERNOR CO.,

(Successors to CONNELLY & CO.)
MANUFACTURERS OF GAS WORKS SPECIALTIES.

"IRON SPONGE." Saves money, saves labor, and is the most efficient purifying material ever offered as a substitute for lime. We guarantee a large saving, both in cost of material and labor.

AUTOMATIC GOVERNOR. OVER FOUR HUNDRED NOW IN USE! NO WORKS COMPLETE WITHOUT IT! WILL PAY FOR ITSELF WITHIN A YEAR! ITS SERVICE SECURES PERFECT DISTRIBUTION! REDUCES LEAKAGE TO MINIMUM, and BENEFITS THE COMPANY and CONSUMER ALIKE! IT IS THE ONLY RECOGNIZED AUTOMATIC COVERNOR IN THE WORLD!

STEAM JET EXHAUSTER. Designed particularly for small works. Combines Exhaust Tube, Steam Governor, Gas Compensator and Bye-Pass Valves in the most compact form possible. Occupies but little space; uses very little steam; saves formation of carbon in retorts; increases yield 10 to 15 per cent. No works too small to use them profitably.

Prices given on all our specialties, delivered at any point in the United States. Correspondence solicited.

CONNELLY IRON SPONGE AND GOVERNOR CO., No. 357 Canal St., New York.

Hughes'
"Gas Works,"

Their Construction and Arrangement,

And the Manufacture and Distribution of Coal Gas.

Originally written by SAM'L HUGHES, C.E.

Rewritten and Much Enlarged by
WM. RICHARDS, C.E

Eighth Edition, Revised, with Notices of Recent Improvements.

Price, $1.65.

A. M. CALLENDER & CO.,
32 Pine St., N. Y. City.

The Gas Engineer's Laboratory Handbook

By JOHN HORNBY, F.I.C.

Price, $2.50.

A. M. CALLENDER & CO., 32 Pine Street, N. Y. City.

The Chemistry of Illuminating Gas.

By NORTON H. HUMPH Price, $2.40.

A. M. CALLENDER & CO., 32 PINE ST., N. Y. CITY

Cyanogen.

A PURIFYING MATERIAL FOR GAS.

Soft and porous, it can be used in the natural state without any preparation, and it ensures perfect purification.

SPECIMENS AND PRICES ON APPLICATION.

VAN BAARDA & CO.,
MINE OWNERS,
DUSSELDORF-ON-THE-RHINE.

Parson's Steam Blower,

FOR IMPROVING BAD DRAUGHT IN BOILERS, AND FOR BURNING BREZEE OR OTHER WASTE MATERIAL.

PARSON'S TAR BURNER,

FOR USING COAL TAR AS FUEL.

PARSON'S AIR JET TUBE CLEANER,

FOR CLEANING BOILER TUBES.

These devices are all first-class. They will be sent to any responsible party *for trial*. No sale unless satisfactory. Manufactured by the WATERTOWN STEAM BLOWER COMPANY

H. E. PARSON, Supt., 67 Bremen Street, Brooklyn, N. Y

JAMES D. PERKINS, President. F. SEAVERNS, Treasurer.

THE PERKINS COMPANY,

228 and 229 Produce Exchange, New York City.

TIDEWATER SALES AGENTS FOR THE FOLLOWING:

Ocean Mine Youghiogheny Gas Coal,
Old Kentucky Shale and O. K. Boghead.

SHIPMENTS FROM NEW YORK, PHILADELPHIA, BALTIMORE AND NORFOLK.

BERWIND-WHITE COAL MINING COMPANY'S

Ocean Westmoreland Gas Coal.

Offices:
Washington Building, New York.
Betz Building, Philadelphia.

STRICTLY High Grade. . . . .
Carefully prepared.
For Gas Making or
Heavy Steaming.

SCIENTIFIC BOOKS.

NEWBIGGING'S HANDBOOK. By Thos. Newbigging. 6th edition. $6.

COX'S GAS FLOW COMPUTER. $2.50.

FIELD'S ANALYSIS, 1898. $5.

HUGHES' GAS WORKS. $1.65.

POOLE ON FUELS. By Herman Poole. $3.

GAS ENGINEER'S POCKET-BOOK. By Henry O'Connor. $3.50.

TECHNICAL GAS ANALYSIS. $3.

GAS CONSUMER'S HANDYBOOK, by Wm. Richards. 20 cents.

CHEMISTRY OF ILLUMINATING GAS. By Norton H. Humphrys. $2.40.

PRACTICAL TREATISE ON HEAT By Thomas Box. 2d edition. $5.

PRACTICAL PHOTOMETRY: A Guide to the Study of the Measurement of Light. By W. J. Dibdin. $3.

CHEMICAL TECHNOLOGY: Vol. I., *Fuel and Its Applications*, $5. Vol. II., *Lighting*, $4.

IRONWORK: Practical Designing of Structural Ironwork. By H. Adams. $3.50.

GAS WORKS: Their Arrangement, Construction, Plant and Machinery. $5.

PRACTICAL HANDBOOK ON GAS ENGINES, by G. Lieckfield. $1.

LIQUID FUEL FOR MECHANICAL AND INDUSTRIAL PURPOSES. By E. A. Brayley Hodgetts. $2.50.

COAL: Its History and Use. By Prof. Thorpe. $3.50.

HEAT A MODE OF MOTION. By John Tyndall. $2.50.

THEORY OF HEAT. By J. Clerk-Maxwell. $1.50.

MANUAL FOR GAS ENGINEERING STUDENTS. By D. Lee. 40 cents.

GASFITTER'S GUIDE, by John Eldridge 40 cents.

AMMONIA AND AMMONIUM COMPOUNDS. By Dr. R. Arnold. $2

CONSTRUCTION OF GAS WORKS, by Walter Ralph Herring. $2.

DIGEST OF GAS CASES. $5.

PRACTICAL HINTS ON REGENERATOR FURNACES By M. Graham. $1.25.

A TREATISE ON THE COMPARATIVE COMMERCIAL VALUES OF GAS COALS AND CANNELS. By D. A. Graham. $3.

A TEXT BOOK OF INORGANIC CHEMISTRY. By Prof. Victor Von Richter. $2.

ILLUMINATING AND HEATING GAS. By W. Burns. $1.50

HANDBOOK FOR MECHANICAL ENGINEERS. By H. Adams. $2.50.

TREATISE ON MASONRY CONSTRUCTION. Baker. $5

GAS ENGINEER'S LABORATORY HANDBOOK. By Jno. Hornby. $2.50.

GAS LIGHTING AND GAS FITTING. By W. P. Gerhard. 50 cents.

PRACTICAL PLUMBING. By P. J. Davies. $3.

AMERICAN PLUMBING. By Alfred Revill. $2.

CEMENT: A Manual of Lime and Cement, their Treatment and Use in Construction. By A. H. Heath. $2.50.

A COMPARISON BETWEEN THE ENGLISH AND FRENCH METHODS OF ASCERTAINING THE ILLUMINATING POWER OF COAL GAS. $1.60.

ELECTRICITY.

INDUSTRIAL PHOTOMETRY, with Special Application to Electric Lighting. By A. Palaz, Sc.D. $4.

ELEMENTS OF ELECTRIC LIGHTING, Including Electric Generation, Measurement, Storage and Distribution. By Philip Atkinson. $1.50.

ELECTRIC TRANSMISSION OF ENERGY. By G. Kapp. $3.50.

ELECTRICIAN'S POCKETBOOK. By Monroe and Jamieson. $2.50.

MAGNETISM AND ELECTRICITY. By J. Overend. 40 cts

DYNAMO BUILDING. By F. W. Walker. 50 cents.

DOMESTIC ELECTRICITY FOR AMATEURS. By E. Hospitalier. $2.50.

PRACTICAL MANAGEMENT OF DYNAMOS AND MOTORS. $1.

PRACTICAL GUIDE TO THE TESTING OF INSULATED WIRES AND CABLES. $1.

ELECTRIC LIGHTING, by Francis B. Crocker. $3.

ELECTRIC LIGHT FITTING. $2.

PRACTICAL ELECTRICITY. $2.50.

ELECTRICITY FOR ENGINEERS. $2.50.

ELECTRICITY, Its Theory, Sources and Applications. By John T. Sprague. $6.

The above will be forwarded upon receipt of price. If sent by mail or express, postage or express charges must be added to above prices. We take especial pains in securing and forwarding any other Works that may be desired, upon receipt of order. All remittances should be made by check, draft, or post office money order. No books sent C.O.D.

A. M. CALLENDER & CO., 32 Pine Street, New York.

The Despard Gas Coal Co.,

MINERS AND SHIPPERS OF

DESPARD GAS COAL,

AND MANUFACTURERS OF

COKE.

MINES, - - Clarksburgh, Harrison Co., West Va.
WHARVES, - - - Locust Point Baltimore, Md.
OFFICE, - 640 Equitable Building Baltimore, Md.

ROUSSEL & HICKS, 71 Broadway, N. Y. } AGENTS, { BANGS & HORTON 60 Congress St., Boston.

KELLER ADJUSTABLE COKE CRUSHER.

Strong, Simple, Durable. Will Crush any Size Desired.

C. M. KELLER,
Sec. & Supt. Gas Lt. & Coke Co.,
Columbus, Ind.
Correspondence Solicited.

Do You Wish to Know

what size of pipe to use to convey any quantity of gas, any distance, with any loss of pressure and any initial or final pressure? Then use

Cox's Gas Flow Computer,

as it gives this information accurately at sight, without mental effort. No calculations needed. Saves time, money and mistakes.

Price, 6.5 x 8 inches, in cloth case, $2.50. For sale by

A. M. Callender & Co., 32 Pine St., N. Y.

GREENOUGH'S "DIGEST OF GAS CASES."

Price, $5.00.

This is a valuable and important work, a copy of which should be in the possession of every gas company in the country, whether large or small. As a book of reference it will be found invaluable. It is the only work of the kind which has ever been published in this country, and is most complete. Handsomely bound. Orders may be sent to

A. M. CALLENDER & CO., 32 Pine St., N. Y.

— THE —

PENN GAS COAL CO.

OFFER THEIR

Coal, Carefully Screened and Prepared for Gas Purposes.

Their property is located in the Youghiogheny Coal Basin, near Irwin and Penn Stations on the Pennsylvania Railroad, and on the Youghiogheny River.

Principal Office:

Room 720, Reading Terminal Building, Phila., Pa.

Points of Shipment:

Pennsylvania Railroad Piers; Greenwich Wharves, Delaware River: Pier No. 1 (Lower Side), South Amboy, N. J.

EDMUND H. McCULLOUGH, Prest. CHAS. F. GODSHALL, Treas. H. C. ADAMS, Sec.

THE WESTMORELAND COAL CO.

Chartered 1854.

Mines situated on the Pennsylvania and the Baltimore and Ohio Railroads, in Westmoreland County, Pa.

POINTS OF SHIPMENT:

PHILADELPHIA, BALTIMORE, SOUTH AMBOY, N. J., WATKINS (SENECA LAKE), N. Y.

Since the commencement of operations by this Company its well-known Coal has been largely used by the Gas Companies of New England and the Middle States, and its character is established as having no superior in gas-giving qualities, and in freedom from sulphur and other impurities.

Principal Office, 224 South 3d St., Phila., Pa.

THE SUN OIL CO.

Crude Oil, Gas Naphtha,
Refined Petroleum, Gas Oil.

Toledo, O., and Pittsburgh, Pa.

Standard Oil Company,

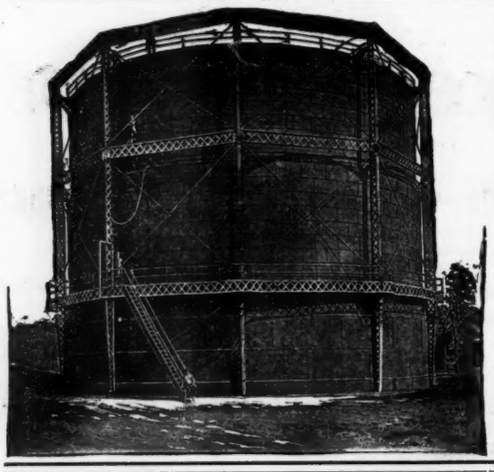
GAS NAPTHA DEPARTMENT.

GAS NAPTHA.

GAS OIL.

Correspondence Solicited.

26 Broadway, New York City.



DAVIS & FARNUM MFG. CO.,
WALTHAM, MASS.

Principal Office & Works, Waltham, Mass. Boston Office, R'm 18, Vulcan Bldg., 8 Oliver St.

Single, Double and Triple-Lift Gasholders of any Capacity. Tubular, Pipe and Sinuous Friction Condensers of all Sizes.

Steel Tanks for Gasholders, Iron Roof Frames and Floors, Purifying Boxes, Center Seal or Valve Connections, Bench Work, Reversible Lime Trays.

Self-Sealing and Pressed Steel Mouthpiece Lids.

Coke Borrows, Coal Wagons, and all Apparatus Requisite for a Complete Gas Works.

Also, Gas and Water Pipe, Flanged Pipe, Sugar House Work, and Special Castings of all Descriptions.

BAXTER & YOUNG,
CONTRACTING AND CONSULTING GAS ENGINEERS.

Examination and Values Ascertained of Artificial and Natural Gas Properties.

OMPLETE GAS WORKS ERECTED.

Artificial and Natural Gas Mains Furnished and Laid.

CORRESPONDENCE SOLICITED.

OFFICE: WAYNE COUNTY BANK BUILDING,
Rooms 201 & 202. DETROIT, MICH.

A. E. BOARDMAN, C. E.,
Consulting and Contracting Engineer.

Particular attention given to Gas, Water and Electric Plants. Long and successful experience with the problem and practice of

Filtration for Public Water Supply.

BREVARD, N. C.

Geo. Shepard Page's Sons.
GAS MACHINERY.

Correspondence Solicited.

69 Wall Street, New York City.

JAMES T. LYNN,
GAS ENGINEER
AND
CONTRACTOR,

Wayne Bank Building, - DETROIT.

GAS PROPERTIES PURCHASED.

DAVID LEAVITT HOUGH,
Consulting Engineer
AND
CONTRACTOR,
374 FIFTH AVE., N. Y

Kerr Murray Manufacturing Company,
Steel Gasholder Tanks,
SINGLE, DOUBLE AND TRIPLE-LIFT GASHOLDERS,
HORIZONTAL AND VERTICAL STORAGE OIL TANKS

Iron Work for Coal Gas Benches, Self-Sealing Mouthpieces, Exhausters, Condensers, Scrubbers, Purifiers, Wooden Trays, Floor Carriages, Center Seal and Valve System Connections, Cast and Wrought Iron Fittings, and Connections 3 to 36 Inches Diameter.

VALVES, Double Gate, Hub and Flange, Outside Screw and Quick Opening, 3 to 36 In. Diam.

COAL AND COKE WAGONS, RETORT HOUSE TOOLS, STREET MAIN SPECIALS AND DRIPS.

Address,

KERR MURRAY MANUFACTURING CO.
Fort Wayne, Indiana.

BARTLETT, HAYWARD & CO.

BALTIMORE, MD.

Triple, Double and Single-Lift Gasholders.

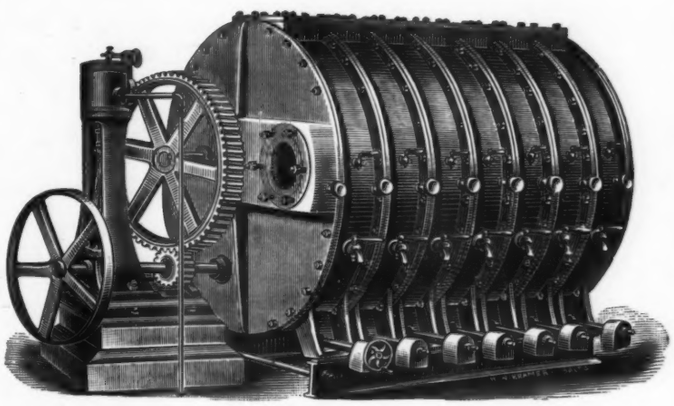
Iron Holder Tanks.

ROOF FRAMES.

Girders.

BEAMS

PURIFIERS.



CONDENSERS.

Scrubbers.

Bench Castings.

OIL STORAGE TANKS

Boilers.

PATENT STANDARD WASHER-SCRUBBER.

The best apparatus for the extraction of all Ammonia and a large proportion of Carbonic Acid and Sulphureted Hydrogen. The Scrubber has been materially improved and is provided with patented Wooden Segmental Grids, instead of Metallic Discs, thus reducing the weight on shaft and power for operating same

The Wilkinson Water Gas Process.

THIRTY-CANDLE, NON-CONDENSIBLE, FIXED GAS. THE MOST SUCCESSFUL GAS PROCESS IN OPERATION.

MILL'S REVERSIBLE LIME TRAYS.

Gas Works Designed and Constructed.

EXCERPTS FROM DECISIONS

—OF THE—

BOARD OF GAS COMMISSIONERS of the COMMONWEALTH OF MASSACHUSETTS.

MR. E. H. YORKE, NEW HAVEN, CONN., Dec. 1, 1898.

Dear Sir:—I am in receipt of a copy of "Excerpts from the Decisions of the Board of Gas Commissioners," which is a handy compilation in book form of extracts from the most recent decisions of the Gas Commission of Massachusetts.

I note that most of these extracts are broad and safe-guiding precepts, which apply with equal force to one Company as to another. The 13 years' existence of the Board of Gas Commissioners with its unusual opportunities for acquiring information, have justly made it a high and safe authority in all matters pertaining to the management, obligations, and rights of Gas Companies. Your little book will serve as a valuable reference library in settling legal complications which often arise between a Gas Company and its customers.

Yours truly, (Signed) F. C. SHERMAN, Superintendent.

A 28-page Pamphlet containing the cream of this Board's decisions as to the proper management of Gas Companies.

Compiled by E. H. YORKE. Price $1.00. Address

A. M. CALLENDER & CO., - No. 32 Pine Street, N. Y. City.

Foundries and Works: { Millville, N. J. / Florence, " / Camden, "

R. D. WOOD & CO.

ENGINEERS, IRON FOUNDERS, MACHINISTS

400 Chestnut Street, PHILADELPHIA, PA.

MANUFACTURERS OF

Cast Iron Pipe.

SOLE MAKERS OF

THE MITCHELL SCRUBBER

(PATENTED.)

PURIFIERS, CONDENSERS, SCRUBBERS, BENCH WORK.

BUILDERS OF

Gas Holders.

Single, Double and Triple Lifts, with or without Wrought Iron or Steel Tanks.

PEASE'S PATENT WIRE ROPE GUIDING FOR GAS HOLDERS.

CUTLER'S PATENT FREEZING PREVENTER For Gas Holder Cups.

THE TAYLOR REVOLVING BOTTOM GAS PRODUCER.

HEAVY LOAM CASTINGS, DUNHAM SPECIALS, HYDRAULIC WORK, LAMP POSTS, VALVES, Etc.

ISBELL-PORTER CO.,

ENGINEERS AND CONTRACTORS FOR THE

Construction and Extension of Gas Works.

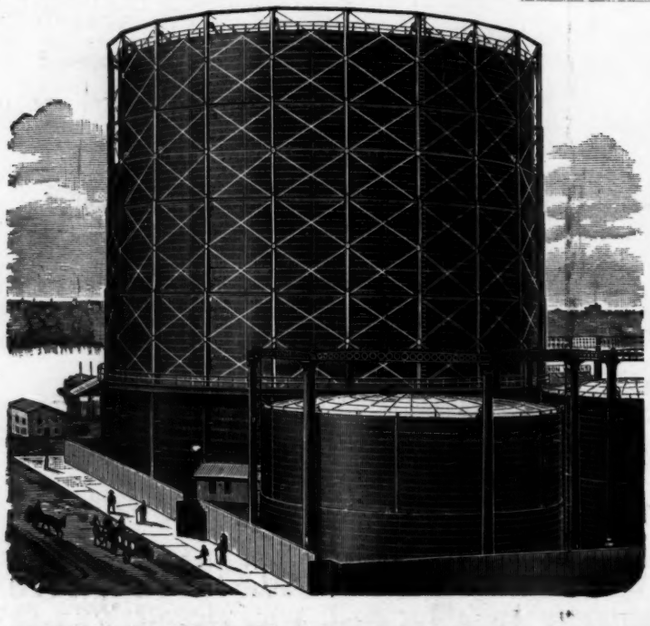
FOUNDERS AND MACHINISTS.

MANUFACTURERS OF

All Ironwork and Machinery Required in a Gas Plant.

Estimates, Drawings and Specifications furnished for the Alteration, Improvement, or Extension of Existing Works or the Construction of New Works.

245 Broadway, New York City. OFFICES Bridge & Ogden Sts., Newark, N. J.



The Continental Iron Works,

THOMAS F. ROWLAND, President.
WARREN E. HILL and CHAS. H. CORBETT, Vice-Presidents.
THOMAS F. ROWLAND, JR., Secretary & Treasurer.

West and Calyer Sts. (Near 10th & 23d St. Ferries)
NEW YORK, Borough of Brooklyn.

BUILDERS OF

Gas Holders.

Single and Multiple Section Gas Holders a Specialty.

STEEL GAS HOLDER TANKS.

BENCH CASTINGS, RETORT LIDS.

Hydraulic Mains, Condensers, Scrubbers, Purifiers, Valves, Etc.

Self-Sealing Retort Mouthpieces & Lids

For Round, Oval, or "D" Retorts.

ILLUMINATING GAS! FUEL GAS!

THE LOOMIS PROCESS.

Now in successful operation at Works of John Russell Cutlery Co., Turner's Falls, Mass., and Henry Disston's Son's Saw Works, Tacony, Pa.

The Cheapest Gas Generating System in the World.

Plans and Estimates Furnished.

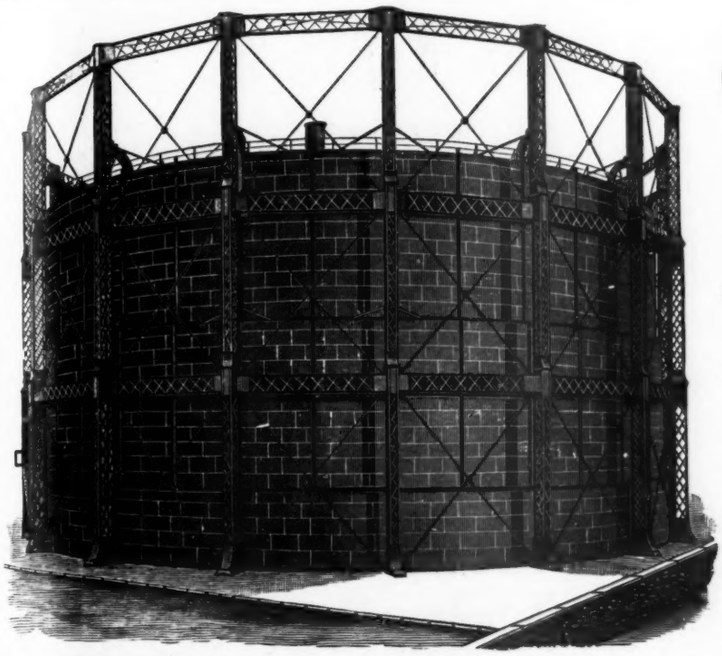
BURDETT LOOMIS, - - Hartford, Conn.

To Gas Companies.

We make to order CAP BURNERS to burn any amount under a stated pressure. Send for samples.

Also SERVICE CLEANERS, DRIP PUMPS, and STREET MAIN PROVING APPARATUS.

C. A. GEFRORER,
248 N. 8th St., Phila., Pa.



H. RANSHAW, Prest. & Mangr. T. H. BIRCH, Asst. Mangr.
WILLIAM STACEY, Vice-Prest. R. J. TARVIN, Sec. & Treas.

THE STACEY MANUFACTURING CO
Established 1851.

Single, Double and Triple-Lift

GASHOLDERS,

Of any Capacity, with or without Wrought Iron or Steel Tanks.

Hydraulic Mains, Condensers, Scrubbers, Purifiers, Valves, etc.

Coal Gas Benches, Roof Frames,

OIL STORAGE TANKS.

Pressed Steel Mouthpiece Lids, Self-Sealing Mouthpiece Lids.

Cincinnati, Ohio.

RITER-CONLEY MFG. CO.,

GASHOLDERS, with or without Steel Tanks.

Purifiers, Condensers, Scrubbers, Oil Tanks, Smoke Stacks.

STEEL ROOFS and BUILDINGS.

PLATE AND STRUCTURAL WORK OF EVERY DESCRIPTION.

GENERAL OFFICE: Pittsburg, Pa. EASTERN OFFICE: 39-41 Cortlandt St., New York City.

WM. HENRY WHITE,

No. 32 Pine Street, - - - New York City.

ENGINEER AND CONTRACTOR FOR THE

ERECTION AND EXTENSION OF

GAS, WATER, AND ELECTRIC LIGHT WORKS.

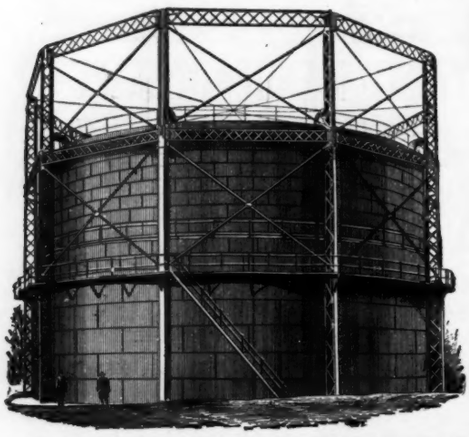
Correspondence with Gas Companies contemplating extending or improving their Plants respectfully invited. Plans and Estimates Furnished.

1899 DIRECTORY 1899

OF AMERICAN GAS COMPANIES

Price - - - - - - - - - $5.00.

A. M. CALLENDER & CO., - - No. 32 Pine Street, New York.



1842 ✻ Deily & Fowler, ✻ 1899

LAUREL IRON WORKS.

Office, No. 39 Laurel Street, Philadelphia, Pa.

BUILDERS OF

Gasholders

Single or Telescopic. With or Without Iron or Steel Tanks.

OIL TANKS, WATER TANKS, AND GENERAL WROUGHT IRON WORK.

JAMES R. FLOYD'S SONS,

Successors to HERRING & FLOYD,

Oregon Iron Works,

West 20th and 21st Streets, Between 10th & 11th Avenues, New York City.

Engineers and Contractors for the Construction of Gas Works.

MANUFACTURERS OF ALL KINDS OF CASTINGS AND GENERAL IRONWORK FOR GAS APPARATUS.

Bench Castings, Regenerative and Half Regenerative Furnace Castings, Condensers, Tower Scrubbers, Mechanical Scrubbers, Purifiers, Malleable Iron Retort Lids, Self-Sealing Retort Lids, Hydraulic Hoist Purifier Carriage, Crosses, Tees, Bends, Angles, Reducers, S-Bends, Sectional Sleeves, Plugs, Caps, Street Drips, etc., always on hand.

WOOD'S GAS SCRUBBING AND ENRICHING APPARATUS.

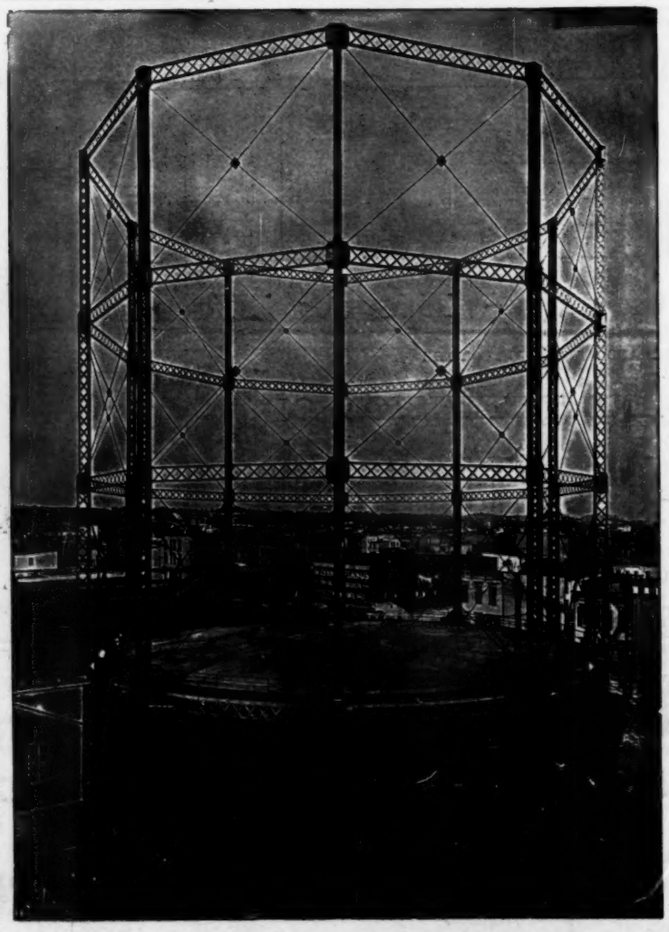
In use at Syracuse, Auburn, Watertown, Cortland and Geneva, N.Y.; Elizabeth, N. J.; Boston, Mass.; Jamaica Plain, Mass.; Providence, R. I.; Northern Liberties Gas Co., Phila.

Sole Manufacturers of the OGDEN QUICK-MOVING VALVE.

HEARNE CENTER SEAL, Operating One, Two, Three or Four Boxes.

Stroh & Osius Concentrator for Ammoniacal Liquor, used by 50 Gas Companies and Cokeries during the past 4 years.

The order for this Triple-Lift Holder and Steel Tank was received by the Logan Iron Works from the Union Gas Light Company, of East New York. The contract was completed and the Holder was in actual use in 90 days from receipt of order. Capacity of Holder, 500,000 Cu. Ft.



LOGAN IRON WORKS,

Brooklyn, N. Y.

MANUFACTURERS OF

Single or Multiple-Lift

GASHOLDERS,

Complete with Steel Tanks.

BENCHES, SCRUBBERS,

CONDENSERS,

PURIFIERS, IRON ROOFS,

Self-Sealing Retort Lids,

AND ALL PARTS OF

GAS WORKS APPARATUS.

Contractors for Complete Works.

ALSO, SOLE MANUFACTURERS OF

C. W. BLODGET'S

HOT GAS SCRUBBER.

YOU CAN GET A PATENT

For any invention. Send me particulars and a rough sketch for advice, free.

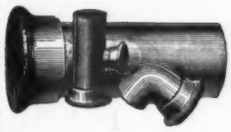
IMPORTANT to have your attorney at Washington, saving time and expense.

HENRY S. THORNBERRY, Patent Solicitor,
1427 F STREET, N. W., WASHINGTON, D. C.

WARREN FOUNDRY AND MACHINE CO.,

Established 1856. Works at Phillipsburgh, N. J.

New York Office, 160 Broadway.

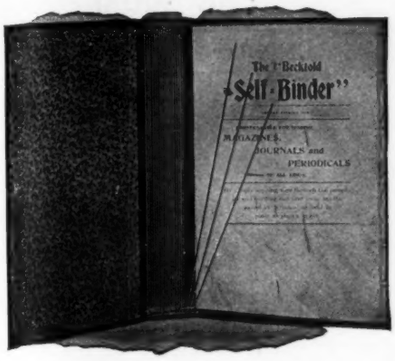


CAST IRON WATER AND GAS PIPE,

FROM THREE TO FORTY-EIGHT INCHES DIAMETER. ALSO, ALL SIZES OF

Flange Pipe for Sugar House and Mine Work. Branches. Bends, Retorts, etc., etc

BINDER for the JOURNAL.



Price $1.00.

A. M. CALLENDER & CO., 32 Pine Street, N.Y

"GLOBE" SPECIALS, "VALVES, ETC." "GLAMORGAN" PIG IRON

M. J. DRUMMOND & CO.

MANUFACTURERS OF

CAST IRON FLANGE GAS and WATER PIPE

GENERAL SALES OFFICE, 192 BROADWAY, NEW YORK.

Western Office: Monadnock Block, Chicago, Ills.

GEORGE ORMROD, Mangr. & Treas., Emaus, Pa.
JOHN DONALDSON, Prest., Betz Bldg., Phila., Pa

EMAUS PIPE FOUNDRY.

DONALDSON IRON COMPANY. EMAUS, PA.

MANUFACTURERS OF

CAST IRON PIPE AND SPECIAL CASTINGS

FOR WATER AND GAS.

Also, FLANGE PIPE, LAMP POSTS, Etc.

POOLE ON FUELS.

THE CALORIFIC POWER OF FUELS.

By HERMAN POOLE, F.C.S.

Price, $3. For Sale by

A. M. CALLENDER & CO., 32 PINE ST., N.Y. CITY.

The Gas Engineer's Laboratory Handbook.

BY JOHN HORNBY, F.I.C. Price, $2.50.

A. M. CALLENDER & CO., 32 PINE ST., N. Y. CITY

Established 1854.

D. McDONALD & CO.,

MANUFACTURERS OF

WET AND DRY METERS, STATION METERS AND METER PROVERS.

—ALSO MAKERS OF

THE GLOVER PREPAYMENT METER.

The amount of gas delivered for the coin can be instantly and positively changed without removing the meter or replacing any parts.

The gas registered agrees absolutely with the amount purchased by the coin.

WE HAVE MADE AND SOLD IN THE UNITED STATES

OVER 30,000 OF THESE METERS,

ALL OF WHICH ARE GIVING PERFECT SATISFACTION.

Correspondence Solicited.

511 West Twenty-first Street, NEW YORK. | 51, 53 & 55 Lancaster Street, ALBANY, N. Y. | 34 & 36 West Monroe Street, CHICAGO.

NATHANIEL TUFTS METER CO.

ESTABLISHED 1849. No. 8 Medford Street, BOSTON, MASS.

Manfrs. of Consumers', Station, Test and Experimental Meters.

PREPAYMENT GAS METERS.

ABSOLUTELY POSITIVE IN REGISTRATION. THE CONSTRUCTION IS SIMPLE AND STRONG.

THE EQUAL OF GAS RANGES FOR INCREASING CONSUMERS AND GAS SALES.

CHARLES E. DICKEY. JAMES B. SMALLWOOD. CHARLES H. DICKEY.

THE MARYLAND METER AND MANUFACTURING CO.

Established 1866.

BALTIMORE, North & Saratoga Sts. **CHICAGO, 107 West Monroe St.**
SAN FRANCISCO, 221 Front St.

CONSUMERS' & STATION METERS, PRESSURE GAUGES, Etc., Etc.

"Perfect" Gas Stoves

MORE OLD METERS

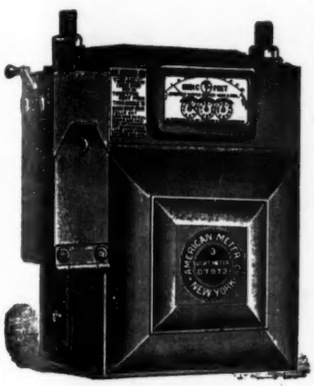
for Repairs have come to us this year than in the entire three years previous. . . . . .

WE HAVE A SEPARATE SHOP

for Repair work, receive Meters of all makes, and employ a large force of men. Return all moderate sized lots of one hundred or under, in Ten days to two weeks.

WORK GUARANTEED.

KEYSTONE METER CO.,
ROYERSFORD, PA.



American Meter Co.

NEW YORK, PHILADELPHIA,
SAN FRANCISCO.

Prepayment Meters.

Their construction is such that they may be readily readjusted when the scale of gas rates is changed.

HELME & McILHENNY,

Established 1848. **1339 to 1349 Cherry Street, Philadelphia, Pa.**

MANUFACTURERS OF

Wet and Dry Gas Meters, Station Meters, Provers, Gauges, Etc.

METERS REPAIRED

PREPAYMENT GAS METERS.

Our Own Patents. Strong. Simple. PROMPT ATTENTION. CORRESPONDENCE SOLICITED.

METRIC METAL COMPANY,

MAKERS OF

GAS METERS for NATURAL and ARTIFICIAL GAS.

Special Attention given to Repairing METERS of all Makes.

FACTORY AT ERIE, PA.

THEODORE D. BUHL, President. CHAS. H. JACOBS, Secretary-Treasurer.

DETROIT METER COMPANY,

DETROIT, MICH.

MAKERS OF . . .

GAS METERS.

OUR equipment embraces the Latest and Most Improved Machinery. We make our own Tin Plate. We claim for **"BUHL" METERS, Increased Durability,** with probability of **Fewer and Less Expensive Repairs,** and **More Accurate Adjustment.** Comparisons invited. Meters of other Makers promptly Repaired.

MAIL ORDERS SOLICITED.

The Advertisement of

JOHN J. GRIFFIN & CO., Mfrs. of Gas Meters, etc.,

Nos. 1513, 1515, 1517, 1519 & 1521 Race Street, Philadelphia,

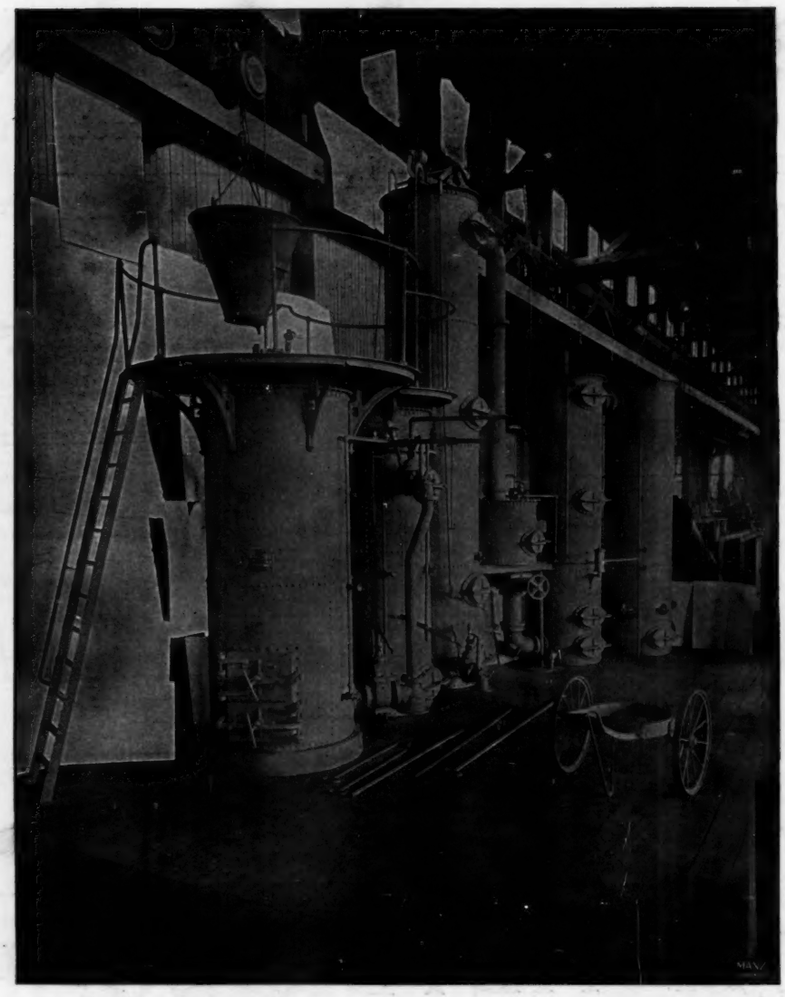
52 Dey Street, New York, 75 N. Clinton Street, Chicago,

Occupies this space every alternate week.

WHEN A GAS MAN KNOWS

THAT HIS

This is not special—it happens to all, only the others haven't the honor of appearing in the JOURNAL.



If you elsewhere see this style of AUTOMATIC FUEL CHARGING DEVICE;
If you elsewhere see this style of DOUBLE SUPER-HEATER PLATFORM APPARATUS;
REMEMBER, it has been COPIED BODILY FROM US.

IMPROVED LOWE WATER GAS APPARATUS

Is **completely put together** in our shop before shipment, being only dismantled sufficiently for transportation, **he has an assurance,** not otherwise possible, that when it is re-erected in his works **it will fit, and Look to Fit, and, most important, IS FIT.**

WILLIAM HENRY WHITE,
EASTERN ENGINEER,
32 Pine St., New York.

The Western Gas Construction Co.,

FORT WAYNE, INDIANA.